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CONTENTS.

EDITORIALS:
Revised Electrical Rules of Chicago..... 757
Regulation of Public Utilities in England..... 758
The Trend of English Invention..... 758
Arrangements for Convention of National Electric Light Association..... 759
Economies Anticipated in the St. Paul Electrification..... 759

DEPARTMENTS:
Commercial Practice..... 768
Electric Sign Data..... 771
Electrical Construction..... 772
Dollar Wiring Kinks..... 778
Public Service Commissions..... 779
New Electrical and Mechanical Appliances..... 790
Latest Approved Fittings..... 796
Current Electrical News..... 797
Record of Electrical Patents..... 803

LEADING ARTICLES:
Electricity in Woodworking Plants..... 763
Company and Employee.—By W. M. Scott..... 768
Revised Electrical Rules of Chicago..... 772
American Institute of Electrical Engineers..... 782

LETTER TO THE EDITOR:
Comment on Kinks.—By H. E. Weightman..... 776

MISCELLANEOUS:
Steam Turbines Discussed at Pittsburgh..... 760
Peoria Electric Club Has Banquet and Election of Officers 760
Program of Iowa Electrical Association Convention..... 760
Electrical Exports for February..... 760
Electric Motor Club of Boston..... 761
The Art of Tube Lighting..... 762
Dr. Steinmetz Lectures in Lynn, Mass..... 762
Electric Light for the Poor Man's Cottage..... 770
Program of Iowa Electrical Contractors' Association..... 773
New Store and Office Building of the Sanborn Electric Company..... 774
Electrical Rules in Grand Rapids..... 775
Fixture Costs..... 776
Electrical Inspection in Oregon..... 777
Louis B. Van Nuys..... 777
Among the Contractors..... 777
Public Utilities Make Fine Showing at Efficiency Exposition and Conference..... 780
Newcomb Carlton Elected President of Western Union Telegraph Company..... 781
The Illumination of Railway Signals..... 785
The National Electric Light Association Convention, Philadelphia, June 1 to 5..... 787
Francis Jehl Honored by Emperor Francis Joseph..... 789

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REVISED ELECTRICAL RULES OF CHICAGO.

Improvements in electrical construction methods and the development of new appliances and devices necessitate rather frequent revision of official rules governing electrical construction. Thus it has become the custom to revise the National Electrical Code about every two years. The National Code, in order to cover average conditions throughout the country, cannot contain certain desirable restrictions necessitated by special conditions, such as in our very large cities. Most of these cities, therefore, have adopted electrical rules based almost entirely upon the National Electrical Code but containing additional limitations necessitated by the crowded conditions, frequent alterations and special hazards in large cities. To Chicago has fallen the distinction of taking a leading position in the drafting of such additional rules. These, while codified as a distinct set of rules and regulations, are based almost entirely upon the National Code, and like the latter require revision from time to time.

In another part of this issue will be found mention of the principal changes made in the Chicago rules during the recent revision, which has just been made public in book form. Of the 43 principal changes, 21 were made to correspond with the 1913 edition of the National Electrical Code; 4 were made to correspond approximately to the National Code; 18 revisions contain more or less important departures from the National Code, and it is of some of these that particular mention will be made in these comments.

Noteworthy among the revisions in the Chicago rules that are necessitated by the demand for improved construction is the requirement for the use of lead-covered wire for use in all underground conduits. Series arc-lighting systems are not permitted for inside lighting except by special permission. Strict specifications are laid down to insure that service switches and cutouts shall be located in a readily accessible position and very close to the entrance of the service wires into the building.

In revising the rule respecting the loading of branch circuits, the new stipulation of the National Code permitting 16 sockets or receptacles on an ordinary 660-watt branch circuit, has been adopted; but a unique additional requirement is specified for buildings used as apartments, residences, offices or stores. This is that a sufficient number of circuits must be provided to allow for at least one watt per square foot of floor surface. Under present conditions this is probably an excellent

rule, but if the new nitrogen-filled tungsten lamps, or any other type of extra-high-efficiency lamps to be developed in the future, should come into general use in small units, such a requirement may prove burdensome.

A radical feature of the new Chicago rules is the prohibition, after June 30 of this year, of open-work construction in all buildings except where excessive moisture, acid fumes or corrosive vapors exist, or where the installation of other approved forms of construction is impracticable; in these cases special permission in writing must be obtained for open-work construction. Another very important prohibition is that after June 30 of this year wooden moldings will not be allowed. While both of these prohibitions may seem drastic, they are desirable steps in advance which doubtless will be followed in other places. Another striking requirement is that outlet boxes for interior conduit work must be covered in all completed installations and such boxes must be provided with fixture studs or ears for fastening the covers. Conduit must also be fastened by means of toggle or expansion bolts instead of being secured by nails or screws driven into wooden plugs in the case of brick, tile or similar walls. The draining of conduit systems in damp buildings is also required.

A set of ten new rules dealing specifically with the wiring in garages is included. These are classified as subdivisions of rule 38C. The numbering of this rule and also of rules 38A and 38B, which are sets of rules dealing with buildings in which special hazards exist, is liable to some confusion, since the rules given under section 38 deal with the wiring of theaters and assembly halls and include rules 38a, 38b, 38c, etc. The National Code does not have special rules covering the wiring in hotels, hospitals, department stores and similar buildings, such as are included in rule 38A in the Chicago set of rules, nor rules covering the wiring in exposition buildings, such as are included under rules 38B in the Chicago Code. In order to avoid possible confusion in numbering these special rules, it may seem better to change the rules 38A, 38B and 38C to 38I and 38II and 38III. Thus there would be less likelihood of typographical and other errors if the rule 38Cc, for example, be written 38IIIc. The fact that the Chicago rules follow out the general numbering system of the National Code eliminates considerable confusion and is a desirable feature. However, there seems to be no place in the National Code for special rules covering buildings in which peculiar hazards exist, excepting as sets of rules supplementing the general class 38 in the manner suggested.

THE TREND OF ENGLISH INVENTION.

The close student of technical journals, wherein are detailed the new devices which emerge from the brain and the laboratory of the inventor, is able to keep himself tolerably well informed concerning the predominating lines of inventive ingenuity in his own particular department. But we are better able to get a comprehensive view of the general trend of invention, though not necessarily of patents which eventuate into articles of practical utility, by an examination of the statistical returns and observations of those who control our official patent departments. It is among their duties to act as trained observers in such matters and very interesting their statements sometimes are. A case in point is the annual report of the British Comptroller of Patents.

From this document we learn that the problems of transport have been exercising more inventive minds in England than any other subject, "demonstrating in a striking manner the fact that this is the age of locomotion." Varied applications relating to the motor-vehicle industry stand out with an increase of 25 per cent for the year 1913. The saving of life, the regulation of speed, the construction of small dynamos for lighting and starting, the connection of head lamps to steering gear—these are some of the chief subjects covered in the locomotion department, while interest in aeronautics has been confined mainly to improvements in details of machines of well known types. Internal-combustion engines, both for motor vehicles and flying machines, have required an active department.

Fatal collisions on railways, as is generally the case, stimulated the inventor interested in signalling problems, and the number of applications in 1913 was treble that of 1912, the proposals chiefly relating to automatic or partly automatic devices for signalling or stopping trains.

Recent legislative enactments have stimulated interest in methods of signalling in connection with the winding and hauling operations in mines. Special attention has also been given to the development and perfecting of apparatus for effecting a selective and intermittent exposure of signs and announcements. The electric theater shows no signs of falling off in popularity, and this fact has encouraged the exercise of much ingenuity concerning the projection of pictures in natural colors.

REGULATION OF PUBLIC UTILITIES IN ENGLAND.

The New York Public Service Commission for the First District included in its last annual report a statement by the librarian and statistician of the Commission, Dr. Robert H. Whitten, regarding the regulation of public service companies in Great Britain. Since in that country there is no written constitution, Parliament is free from external restraints in dealing with franchises, incorporations, rates and other matters, even to the extent of confiscating private property. Public opinion, however, is a sufficient restraint against doing anything which would not generally be regarded as just. Any action taken, however, is not subject to court review.

Most companies operating public utilities have had their powers defined by special acts of Parliament, and there are very few acts which apply to different classes of public service companies. In many cases the profits and rates of gas companies are limited

by an arrangement, according to which the allowable dividend is based upon the price charged to consumers according to a sliding scale. In the case of Sheffield, the salary to be paid the manager and directors increases automatically with the decrease in the price of gas. Such arrangements as these seem an admirable method of stimulating the greatest efficiency in the operation of the utility.

The issue of bonds is in general limited to a definite fraction of the capital stock, seldom more than one-third. Interest not exceeding four per cent may be paid from the capital account during the construction period, provided full publicity is given to the process, including notification of the Board of Trade. Securities are usually disposed of at auction or by a method of tendered bids, similar to the American method of awarding contracts. This has been found generally satisfactory and might well be imitated in this country. The company is privileged to set a reserve price which is filed with the Board of Trade in a sealed envelope. If the sale by bids does not equal the issue of securities, the company may dispose of the remainder to stockholders, employees and consumers at the reserve price.

Interlocking directorates and concentrated control of corporations is avoided by not giving a vote to every share of stock. The voting power decreases as the number of shares held by an individual increases. In the case of one corporation it is provided that no stockholder may have more than six votes.

A study of the British methods might be of advantage to our American congressmen at this time when there is an effort being made at Washington to change our laws so as to secure results, some of which are already in operation in England. A difficulty exists, however, in the fact that most companies in this country are incorporated under the laws of the separate states and it would only be by requiring those engaged in interstate commerce to incorporate under a federal law that control of them can thus be enforced. Such companies however are the principal ones which Congress wishes to control. Local concerns such as public service companies doing business in a single community are sufficiently controlled by local means and do not need the attention of Congress.

ARRANGEMENTS FOR CONVENTION OF NATIONAL ELECTRIC LIGHT ASSOCIATION.

The selection of the Bellevue-Stratford Hotel as headquarters for the convention of the National Electric Light Association to be held in Philadelphia next June insures adequate and satisfactory facilities for carrying on the various activities of the convention. Some interior and exterior views of the hotel are shown elsewhere in this issue. The location of the exhibits upon the top floor of the building adjacent to the Roof Garden will form the most attractive setting for this feature of the convention that has been seen for many years, if ever before. The Convention Committee is actively at work making plans for a number of features which give promise of a very successful convention.

ECONOMIES ANTICIPATED IN THE ST. PAUL ELECTRIFICATION.

No more important steam railroad electrification has been developed in recent years in this country than that of the Chicago, Milwaukee & St. Paul Railroad in Montana, considering the abolition of the present motive power from the standpoint of operating efficiency. The company's engineers estimate that electrification will save at least 25 per cent in operating costs and it is a foregone conclusion that the quality of service in this mountainous region will be vastly improved by the change. The substitution of electricity will do away with the haulage of coal, at once releasing a large number of coal cars for revenue service. Coal-storage yards will be unnecessary; water tanks will be abolished; and it is likely that the length of freight divisions will be increased from the present length of 100 to a maximum of 200 miles. Engine failures, due to poor coal and bad water, with resulting train delays and heavy repair bills are likely to decrease greatly, and in addition to the expected savings in maintenance due to the electric locomotive, the traffic capacity of the road is to be much enhanced.

It is planned to have the new locomotives capable of hauling a gross trainload of 2,500 tons on a one-per-cent grade at a speed of 15 to 20 miles per hour, whereas the steam locomotives now in use on the Montana divisions haul only 1,650 tons at a speed of from 8 to 10 miles per hour, and the rate is not uniform. Further economies are to be gained by the use of electric braking on down grades, with regeneration of power for use by ascending trains It is figured that when the entire 440 miles of line are electrified, 60 electric locomotives will handle the normal traffic, compared with 82 steam locomotives.

Wages will be saved through the reduction of overtime work on the part of delayed train crews, and by the purchase of energy from the Montana Power Company at a reported price of about five mills per kilowatt-hour, the problem of power supply will be greatly simplified, leaving the transportation matters of the road freer to receive the attention of its officials. No less than seven plants of the company will serve the railroad, and the danger of an extended interruption of service will be remote. Poles cut from the railroad company's own timber lands will be used in power distribution. It is expected that the first 113 miles of line, from Deer Lodge to Three Forks, across the Rocky Mountains, will be completed by the end of the present year, and that 16 electric locomotives will be in use on this section of the road. The entire project will cost about $8,000,000, and the results of the electrification are being awaited by all the northern transcontinental lines with keen interest.

Steam Turbines Discussed at Pittsburgh.

The fourth regular monthly meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers was held at the Seventh Avenue Hotel, Pittsburgh, Pa., Saturday, April 4. An illustrated talk was given by Francis Hodgkinson, chief engineer of the Westinghouse Machine Company on "High, Low and Mixed-Pressure Turbines."

The theoretical merit and development of the different types of turbines was gone into thoroughly, Mr. Hodgkinson using lantern slides and blackboard to make his points entirely clear. The development of the turbine was interestingly described from the 2,000-kilowatt capacity turbines in 1900 to the 30,000-kilowatt sizes of today, and the reduction of steam consumption from 18 pounds to 12 pounds and the investment charges from $120 to $60 per kilowatt capacity.

The early users of the regenerator in connection with the low-pressure turbines was touched upon, and it was related that when regenerators were first used, the regenerative period of several minutes was strived for, and that the present-day practice is to install regenerative capacity for 30 to 40 seconds regenerative periods. In places where conditions were favorable, the possibility of allowing the boilers to blow off into the low-pressure system instead of through safety valve, was suggested, the protective features of the safety valve being maintained in addition.

Mr. Hodgkinson brought out that turbine blading troubles are not caused by collision or rubbing of the blades, but rather by vibration from the steam current, and that the more substantial the blading was made, the more disastrous will be the effects from collision or rubbing.

Peoria Electric Club Has Banquet and Election of Officers.

The Peoria Electric Club held its first annual banquet at the Jefferson Hotel, Peoria, Ill., April 11. The Club is just a year old and its membership is composed of men from all the different electrical industries in Peoria. Following the dinner there was a program of speeches among which were the following addresses: "Our Club," by T. D. Buckwell; "Future Prospects of Electricity," by D. H. Lackey; "Why Electric Salesmen Should Be Live Wires," by E. H. Joseph; "Co-operation," by John W. Foster; remarks by the retiring president, C. A. Hoppin.

A novel election was held by having two tickets nominated by two committees and these two parties were called the "wets" and the "drys," the latter were elected as follows: T. D. Buckwell, of the Central Illinois Light Company, president; Louis B. Van Nuys, of the Central Electric Company of Peoria, vice-president; C. Bradford, secretary-treasurer. It was decided that a smaller number of officers could handle the club matters with less trouble and get better results than the former way of having an executive board composed of six members. A very enjoyable time was had throughout the evening. Much good will be accomplished by the Club during the coming year, if what has already been done last year is any indication.

Electric Club of Chicago.

At the meeting of the Electric Club of Chicago held on April 9, Ellis Prentice Cole gave an illustrated talk on the "Glacier National Park." This park is in the northwestern part of Montana and was established as one of the present 13 national parks in 1910. Mr. Cole described the native Indians and their customs. He then dwelt on the beautiful scenery of the park, showing charming colored pictures of its mountains, lakes, glaciers, streams, falls, flowers, etc. He made a strong plea to "see this country first."

The Entertainment Committee of the Club, of which Vice-President Berry is head, is arranging to give a "stag party" on the evening of April 29 which will be free to members.

Empire State Gas and Electric Association.

The spring meeting of the Empire State Gas and Electric Association will be held in the Alert Club, Medina, on April 22, beginning at 10 a. m. An unusually interesting program has been arranged. The morning session will be devoted to the new workmen's compensation law, which goes into effect in New York State on July 1 next, and to the accident-prevention work of the Safety Committee. The afternoon session will be more or less executive.

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club, Salt Lake City, on April 2. C. C. Pratt, of the Mountain States Telephone & Telegraph Company, chairman for April, presided. Mr. Pratt appointed H. F. Holland, C. B. Hawley and G. H. Williams a committee to draft resolutions of sympathy on the death of V. F. Connolly, a charter member of the Club, who died unexpectedly at Idaho Falls recently.

Miss Helen L. Bartlett, teacher of cooking at the Salt Lake High School, read a paper entitled "Electricity and Its Application to Efficiency Methods in the Home."

Program of Iowa Electrical Association Convention.

As previously announced the fourteenth annual convention of the Iowa State Section of the National Electric Light Association will be held at Cedar Rapids, Ia., April 22, 23 and 24. Following the address of the president, A. L. Dodd, of Charles City, Ia., the following papers will be presented: "Co-operation Between Contractors and Central Stations," by J. T. Marron, Rock Island, Ill.: "The Compensation Law and Its Application," by George A. Wrightman, Des Moines; "A Few Features of the Operation of the New Development at Keokuk," by W. A. Ross, Keokuk; "The Conduct of Public Utilities Under Commission Supervision," by A. C. Huey, Chicago; "High-Tension Lightning Protection," by Prof. A. H. Ford, Iowa City; "Is There a Saturation Point in the Sale of Electricity?" by J. S. Forbes and J. C. Young, Cedar Rapids; "Sale of Electricity to Farmers," by Rufus E. Lee, Clarinda; "The Object and Results of Affiliation," by S. A. Sewall, New York.

On Wednesday evening there will be a banquet, and on Thursday there will be a theater party followed by a Jovian rejuvenation. The meetings of the convention and headquarters of the association will be at the Montrose Hotel, Cedar Rapids.

Electrical Exports for February.

The Bureau of Foreign and Domestic Commerce has issued its monthly summary of the imports and exports of the United States for February. From this are taken the following facts respecting the exports of electrical products during that month.

A falling off of about 13 per cent is reported in the total value of electrical shipments in last February compared with the corresponding month of a year ago. The number of articles shipped in the four classes for which the numbers are reported were: fans, 2,788; arc lamps, 341; carbon-filament lamps, 92,514; metal-filament lamps, 38,499. The detailed figures are given in the following table, together with those of the corresponding month in 1913, as far as the latter are available.

Articles.	Feb. 1914.	Feb. 1913.
Batteries	$ 54,488	.....
Dynamos and generators	206,392	$ 180,706
Fans	36,985	38,133
Insulated wire and cables	153,607	.....
Interior wiring supplies, etc. (including fixtures)	48,954	.....
Lamps—		
Arc	6,918	16,378
Carbon-filament	14,255	5,747
Metal-filament	10,857	31,099
Motors	241,488	378,887
Static transformers	142,888	.....
Telegraph instruments (including wireless apparatus)	6,874	14,625
Telephones	157,851	95,787
All other	848,956	1,458,607
Total	$1,930,513	$2,219,969

Electric Motor Club of Boston.

The Electric Motor Car Club of Boston enjoyed an enthusiastic get-together luncheon at the Hotel Thorndike, Boston, Mass., on April 8. President Day Baker was chairman. Two new members were welcomed—Thomas J. Glenn, of the Fireside Tire & Rubber Company, and Chester B. Raymond, of the Electric Storage Battery Company.

Arrangements were made by which a committee, of which F. J. Stone is chairman, will put in effect the suggestion and offer of Superintendent Atkins of the Boston Edison Company to utilize a large tent for advertising and demonstrating electric cars in New England cities outside of Boston. It is the plan to conduct a traveling exhibit with the tent as headquarters. Here charging will be demonstrated and an exhibit of batteries, tires and other accessories, as well as automobiles, shown. It is proposed to serve tea, prepared electrically, and in the evening to light the tent with 15 500-watt electric lamps. The project will be put into execution in the early summer.

Secretary Charles H. Miles announced preliminary plans for a convention of central-station men and electric automobile interests, on lines similar to those of the convention of last May, to be held in Boston the second week of next month, of two days' duration. The present committee, with Mr. Miles as chairman, is continued, to carry out arrangements.

An electric automobilists' map of New England is to be prepared, under the auspices of the Club; it will show charging stations and routes of touring. Central stations furnishing charging facilities are subscribing for copies, of which about 10,000 will be issued. The cost to central stations is $10 per hundred, and some 2,000 have already been ordered.

The proposal of Mr. Stone was adopted, to co-operate with the Electric Vehicle Association of America in issuing prospectuses, setting forth the advantages of organization to further electric-vehicle interests.

E. S. Mansfield, of the Boston Edison Company, presented plans for the annual outing, to be held in June, and R. S. Hale invited the Club to hold it at the New England Kennel Club, East Braintree.

Mr. Hale stated that the 150-ampere Anderson charging plug had been adopted as the standard in England. He showed samples of charging cables which have been adopted there. It is known as "cab tire wire," and is a very flexible, rubber-insulated wire.

R. B. Daggett suggested the desirability of a committee to formulate the public advantages of the electric, in the best utilization of street space, the simplification of haulage problems, etc., and such a committee was appointed, to confer with the Chamber of Commerce and other public bodies.

The principal address at the luncheon was made by E. E. Fowler, of the Barrett Adding Machine Company, on "The Best Method of Boosting Business During Quiet Periods." Mr. Fowler held that newspaper advertising is the most effective and needs to be used most when business is dull. The problem of securing good salesmen is difficult, but the real test is courage.

Chicago Electrical Show to Give Prominence to Electric Vehicles, Motion Pictures and "Safety First" Devices.

In formulating plans for Chicago's seventh annual Electrical Show, which as already announced in a recent issue will be held at the Coliseum, from October 31 to November 14, 1914, the directors find that the lapse of three years since the last show in Chicago has brought to the front two industries and one nation-wide movement that will have to be given more than passing consideration in the organization of this year's exposition. While there has been marked development in all lines electrical, the most important angles to be considered are those that apply to electric automobiles (both pleasure cars and trucks) and to the motion-picture industry. The other notable movement is that which applies to "Safety First" and efficiency devices, many of which are electrical. It is the present plan of the directors to install a department of exhibits of the "Safety First" type and also a department for electric-motor-driven trucks and pleasure cars.

When the last show was given the motion-picture industry was in its infancy compared with its scope today and it is the intention of the management of the coming show, with the co-operation of some of the important manufacturers, to have an exhibit that will show how motion pictures are made and the multitudinous ways in which electricity is used in the development of a film.

Manager Homer E. Niesz has these various matters under consideration and is in correspondence with concerns identified with these branches of the electrical trades. The office of the Electrical Show have been established at Room 546 Commercial National Bank Building.

Boston Get-together Meeting.

The next get-together meeting of New England central-station men, contractors and jobbers will be held at the American House, Boston, Mass., on May 8.

Electric Vehicle Association Meeting.

The regular weekly luncheon of the Chicago Section Electric Vehicle Association of America was held in the Rose Room, Hotel Sherman, on Tuesday, April 14. No formal program had been arranged, the meeting being devoted to a discussion of the Section's activities. The advisability of substituting monthly meetings for the present weekly ones was discussed. It was also proposed that the Section reserve tables for its members at the weekly luncheons of the Jovian League and The Electric Club. These matters will be discussed further at the annual meeting of the Section on May 5. Tickets for the annual meeting will be ready for sale at the next weekly meeting of the League on Tuesday, April 21.

Many Philadelphia Jovians Pledge Their Support to Women Suffrage Movement.

Miss Dille Hastings, president of the Men and Women's Equal Suffrage League of Philadelphia, spoke at the luncheon of the Jovian Electrical League of Philadelphia at the Bingham Hotel on Thursday, April 9. The men were quite charmed with Miss Hasting's appearance but were not prepared to meet her arguments. Those who began to embarrass the speaker were soon quieted, and Miss Hastings was soon able to convert nearly every man in the room. The 200 men present nearly fell over each other in the rush to sign the suffrage pledges which were provided.

Luncheon of the Dayton Jovian League.

The monthly meeting of the Jovian League, of Dayton, O., was held at the Dayton Club on April 6. J. M. Guild, secretary of the Greater Dayton Association, delivered an interesting talk on "Co-operation." Mr. Guild emphasized the fact that the co-operation of the members of the Jovian League was one of the chief aims of the league. In closing he requested the co-operation of the Jovian League in the greater Dayton movement. The next dinner of the league will be held on April 20, at which time it is hoped that the membership will be increased to 200.

Chicago Jovian Meeting.

At the meeting of the Jovian League of Chicago on April 13, George R. Jones, purchasing agent of the Public Service Company of Northern Illinois, delivered a very interesting address on "Observations of a Purchasing Agent." Mr. Jones recounted several amusing experiences and offered many valuable suggestions to salesmen. Martin J. Wolf presided at the meeting.

The Art of Tube Lighting.

The new art of tube lighting and its future was the subject of discussion at the three-hundred and twenty-seventh meeting of the New York Electrical Society held on Tuesday evening, March 31. Dr. Frederick G. Keyes, of the Cooper-Hewitt Electric Company, gave a preliminary talk on "High-Pressure Mercury Arcs." This discussion included a brief history of the development of fused quartz, a description of mercury-vapor arcs, and a history of the high-pressure arc. He also devoted some discussion to the ultra-violet light emitted by the quartz lamp. Dr. Keyes said in part:

"The development of the high-pressure mercury arc is necessarily inseparably connected with the development of fused quartz. In view, therefore, of the intimate relation, at any rate from a historical standpoint, of fused quartz crystal with the high-pressure mercury arc it has been thought desirable to present briefly some of the more important physical properties of this material and also to exhibit a few specimens of fused quartz.

"Gaudin (1839), appears to be the first, so far as I am able to ascertain, to fuse quartz crystal and draw it into threads. Gaudin noticed some of its splendid mechanical properties but it remained for Professor Boys, in England, to make use of the physical properties of fused quartz filaments in physical apparatus.

"Shenstone, in England, succeeded between 1895 and 1900 in producing small tubes and bulbs of fused quartz, and in 1904 the art of working fused quartz had progressed to such a stage that Heraeus was able to exhibit in Paris a high-pressure mercury arc within an envelope of this refractory material. Since 1900, in fact, the whole art of working quartz and manufacturing high-pressure arcs has advanced with extreme rapidity.

"The most striking peculiarities of fused quartz are perhaps its extremely low coefficient of expansion, which at ordinary temperatures amounts to 20 times less than lead glass or platinum, and its high melting point (1,700 degrees Centigrade). The smallness of the coefficient of expansion is such that the material may be heated to redness and plunged into cold water without cracking.

"In applying fused quartz to the manufacture of high-pressure mercury arcs the first problem to be solved was the manner in which current might be introduced into the exhausted apparatus. This difficulty was partially surmounted by the use of ground plugs of so-called invar metal. Recently methods of effecting a fusion seal have been developed, one of which is in use at present by the Cooper Hewitt Electric Company.

"The relation between the light efficiency of the mercury arc and pressure is such that at about 132 centimeters one obtains 5.26 candles per watt: 132 centimeters is, however, a pressure higher than it is desirable to operate a quartz mercury arc if long life is desired. It is, in fact, preferable to operate at about one atmosphere whereupon a life of a number of thousand hours is possible at an efficiency of approximately three and one-half candles per watt.

"A most interesting feature of fused quartz is its transparency to ultra-violet light. Tubercle bacillae appear to be particularly sensitive while spore-formers are hardly affected. Fortunately, however, most pathogenical organisms are nonsporeformers. The bactericidal action of the ultraviolet light emitted by the quartz mercury vapor arc is being studied enthusiastically both in this country and abroad, and further utilization of the radiation is promised now that a powerful source of ultra-violet light is available particularly along the line of photosynthesis."

D. McFarlan Moore described his latest work with the aid of lantern slides and with a demonstration of various types of apparatus.

Mr. Moore gave a most interesting sketch of the development of tube lighting during the last 21 years, defining its present status, not only in this country but in Europe, and giving a striking sketch of the progress in various scientific branches to which it has given an impetus. One section of Mr. Moore's address, which was listened to with rapt attention, was his description of "the immorality of much commercial lighting." He took a long list of materials and showed by exposing them first under various forms of artificial light and then under daylight, how the public is misled in the selection of materials and colors. He then indicated that this deluding of the public had actually found its way into the shops of butchers, and he exhibited pieces of beef and other meats which under the daylight rays were dark and sodden, and under artificial light, bright red and attractive.

Dr. Steinmetz Lectures in Lynn, Mass.

In Burdell Hall, Lynn, Mass., on April 8, before the Lynn Section of the American Institute of Electrical Engineers, Charles P. Steinmetz delivered a lecture on "Effect of Electrical Engineering on Modern Industry," which was greatly appreciated by a large audience. Dr. Steinmetz feels at home in Lynn, where early in his career he resided for some time while connected with the data department of the Thomson-Houston Electric Company.

The speaker pointed out that the United States was pre-eminently an agricultural country at the start and practically remained such till the time of the Civil War, since which time it has rapidly advanced as an industrial nation. Facility in transportation has been one of the greatest factors in the expansion of these years, and though we hear the railroads criticised yet they have been an agency of great advance. But more potent in some respects than steam lines are the trolley cars that pass our very doors, and not only bring the country to the city, but enable the city worker to live in the suburbs, or in the country itself.

The lecturer then took up the discussion of materials and energy as the two entities necessary to human existence and industrial growth. Civilization depends upon the utilization of materials at a distance from the point of production, and while the steam roads could take care of this in quite an acceptable manner there still remained the particular distribution of materials and transportations of energy. Here is where electricity has had its sweeping effect on modern industry and light, heat and power enter into the engineering scheme of distribution. Electric power may be used economically in small quantities, whereas the steam-engine unit is only economical on a large scale.

Electrical energy as compared with chemical energy has, however, one serious disadvantage in that electrical energy cannot be stored on a large scale. Of course, the storage battery is used but it can hardly be called a vital factor in the world's work. Take a place where navigation closes for a part of the year; no engineer would think of endeavoring to store electrical energy by means of storage batteries but instead would employ chemical energy in the form of coal. Electrical energy is not found in nature in available form like the chemical energy of fuel or the power of waterfalls. It makes no difference at what rate water is used for power, but a uniform rate must be observed to secure the maximum efficiency in the use of electrical energy.

Dr. Steinmetz closed with a brilliant discussion of the alternatives possible to man when the coal supply of the world shall have been exhausted. Aside from the fact that retrogression in population in the future might become a world condition, the resources of science and invention have not yet been fully taxed.

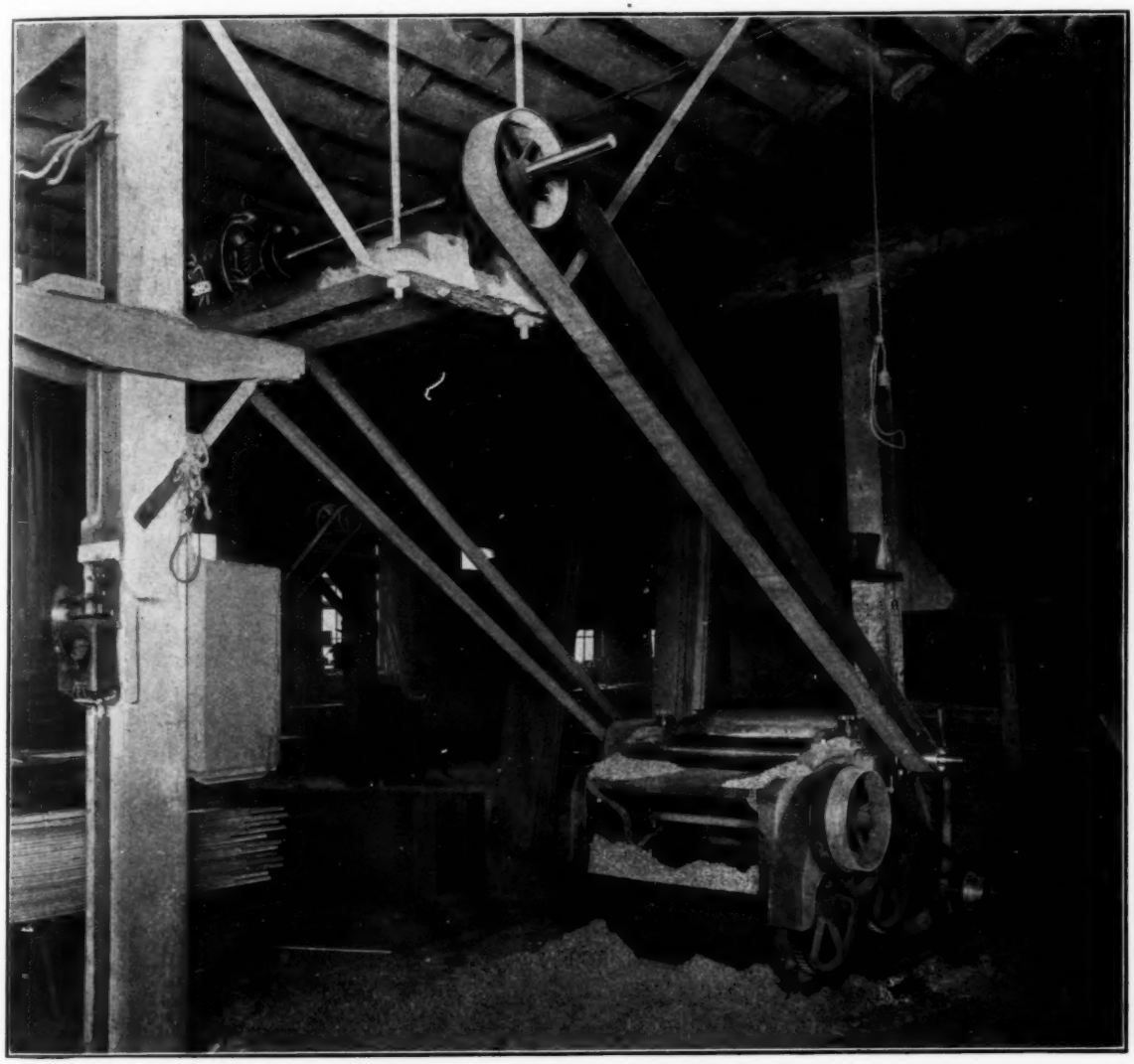
Electricity in Woodworking Plants.

This article discusses the general advantages of electric drive and central-station power, with special reference to a new field open for the disposal of wood refuse. Detailed information concerning several special woodworking plants purchasing power is given in the data sheets.

In previous articles in this journal specific branches of the woodworking industry have been treated from the standpoint of electrification. There are, however, several types of manufacturing establishments that cannot be classed under any of the divisions already discussed and still are of sufficient importance to justify consideration from central-station engineers. In the accompanying data sheets detailed information is presented on three of such plants, devoted respectively to the manufacture of wooden wagon and carriage wheels, special store and bar fixtures, and pick and ax handles. In each of these installations, particularly the wheel plant, the machines used and the manufacturing processes are in a measure peculiar to these industries. However, the general features of drive and the particular advantages of central-station service are the same as in other woodworking industries and some repetition of the innumerable points to consider in soliciting the adoption of central-station service for such plants may therefore be in order.

One of the large items of expense in any woodworking plant is that of power. Yet it is often erroneously assumed that its unit of cost is very low on account of the wood waste available for fuel, and that consequently there is not the necessity for such economy as is practiced in other industries. There is, however, no dodging the fact that lumber at $30 per 1,000 ft. when used as fuel costs 30 times as much as coal at $3 per ton on a comparative basis of heat value.

Progressive managers after careful study of the problem of refuse disposal, have found that the amount of wood in the finished product is somewhere around 70 per cent of the lumber purchased, and that the wood waste can be sold in quan-



Extended-Shaft Motor Driving Double-Drum Planer.

tity at a price many times over its value as fuel. Soft wood shavings are sold for bedding; hardwood shavings for insulating purposes in cold-storage warehouses, for lining cars, for packing breakables and for various uses in nurseries. The blocks of wood are either glued together into heavy door several inches thick for use in cold-storage plants, or are sold as kindling.

Producer gas from wood is another field for waste that was dealt with in a lecture recently delivered by G. E. Lygo before the Junior (British) Institution of Engineers. It was only recently, he said, that gas plant makers had given serious attention to the subject of utilizing wood for use in gas producers. This was no doubt due to the higher price of a wood-waste plant as compared with an anthracite plant and the low price of anthracite, but with the increased cost of coal, manufacturers having combustible waste materials of little value and difficult to dispose of were looking out for means of utilizing them, and the advent of reliable wood-waste suction plants had given them an opportunity of effecting considerable economy. In these plants all kinds of wood, from sawdust to pieces six inches in diameter, cotton seeds, cocoanut shells, fiber, and dust, sugarcane, coffee husks, rice husks, spent tanning bark, rubber leaf waste, surface peat, etc., could be used.

Referring to the design of the plant, many points had to be taken into consideration which were not needed with an anthracite plant. The area of the generator was governed by the nature and size of the fuel, but, roughly speaking, it was two and one-half times that required for coal fuel. The depth of the fuel depended upon its size and density. A deep fuel bed was necessary for large pieces of wood, else air passed through and ignited the gas in the top of the generator.

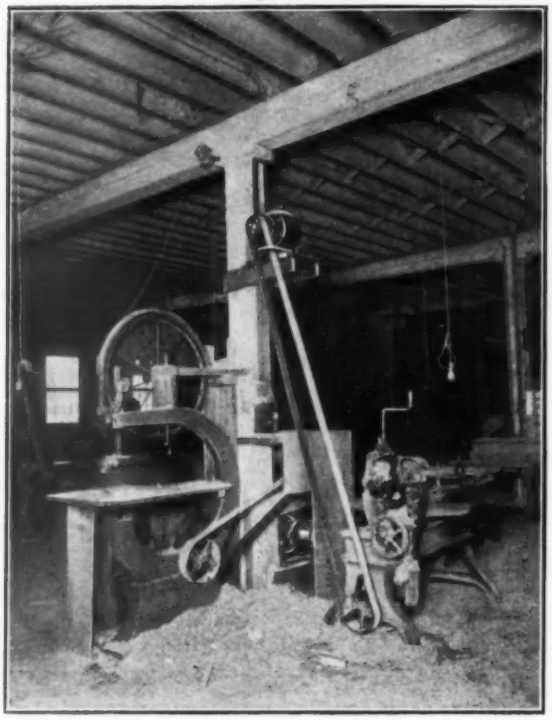
Small, dense fuel, such as sawdust and coffee husks, required a comparatively shallow bed, or its resistance would interfere with the working of the engine. The internal hopper had to be designed to suit the fuel, some fuels falling evenly in the generator, while others formed a cone in the center. The external hopper was of large capacity. A vaporizer was not required, as there was no necessity to keep down the temperature in the combustion zone, and the loss of hydrogen was more than made up by the volatile gases in the fuel.

The gas had to be cooled and washed as soon as it left the generator, else the heavy tar and dust in suspension would be deposited and choke the connecting piping. In Whitfield plants an anti-fluctuator was provided, which insured a steady flow of gas from the generator. The variation of pressure on the suction stroke rarely exceeded 1 inch of water, whereas six inches was not uncommon in plants without the anti-fluctuator.

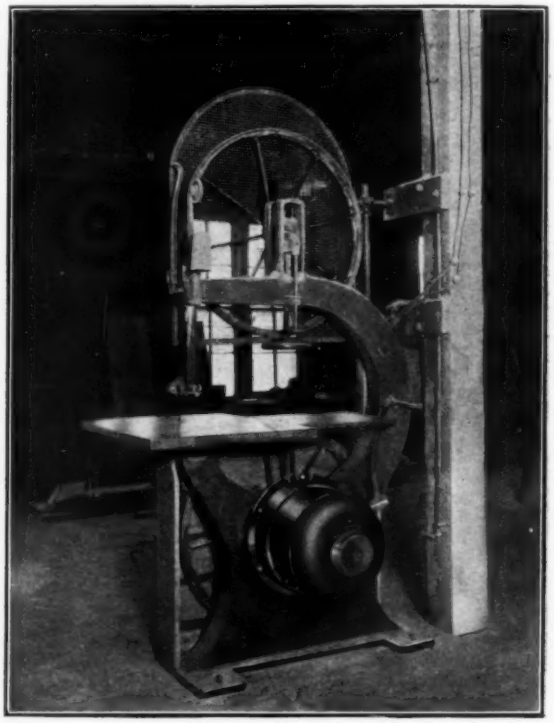
The calorific value of wood when air-dried was approximately 6,000 British thermal units per pound. The amount consumed per brake horsepower depended upon the moisture, which amounted to 10 to 20 per cent in air-dried wood and 30 to 50 per cent in fresh timber. Fuel which contained excess of moisture had to be dried until it did not exceed 60 per cent, otherwise it was difficult to make the generator fire burn evenly. The gas produced was of higher value than that from anthracite, namely, about 150 British thermal units to 170 British thermal units per cubic foot, as against 120 British thermal units to 140 British thermal units from the latter.

As regards cost of working, a test made with a Whitfield producer supplying an 84 brake-horsepower engine coupled to a 105-volt dynamo gave 540 British thermal units for 2,072 pounds of fuel consumed, or 3.83 pounds of fuel per kilowatt. The test extended over 10 hours, and the fuel consisting of oak and elm sawdust and chips from working machinery, had no value for other purposes.

In one factory, before the installation of the producer, the same work had been done by a steam plant, when, in addition to the same amount of wood waste, upward of 500 tons of coal per annum were consumed.



Band Saw and Lathe Driven by Individual Motors.



Motor-Driven Band Saw.

Importance of Speed Regulation.

The matter of speed regulation cannot be too thoroughly emphasized. Most plants employing mechanical drive suffer severely from poor speed regulation. The engine slows down under load and there is considerable slippage in each

Woodworking Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant manufacturing carriage and wagon wheels exclusively. There are 175 men employed working 10 hours per day. The average monthly output is 5,000 to 6,000 sets of four wheels.

Total connected horsepower, 347. Total number of motors installed, 31. Average kilowatt-hours per month, 34,927.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
April	27,957	August	36,865	December	36,890
May	30,981	September	37,319	January	35,777
June	28,549	October	42,138	February	34,628
July	41,278	November	36,343	March	33,206

Load-factor, 19 per cent; operating-time load-factor, 38.7 per cent.

All of the wood refuse is used for furnishing steam for the dry kiln, and coal is purchased for heating purposes in winter only.

Motor Installation.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horsepower.	Speed R. P. M.	Application.
1	5	1,800	Belted to a line shaft driving one 36-inch band saw; one 20-inch pony planer; and one belt sander.
1	2	1,650	Belted to a line shaft driving one 16-inch lathe; two small drill presses; and one small shaper.
1	0.5	1,650	Direct-connected to forge blower.
1	10	1,200	Belted to line shaft driving one tenoning machine; one equalizing saw; one wheel-assembling machine; and one wheel-sizing machine.
1	7.5	1,200	Belted to a line shaft driving one wheel press; three drill presses; one 16-inch double emery wheel; and one wheel-facing and boring machine.
1	5	1,800	Belted to line shaft driving one 2,000-pound freight elevator; and one post drill.
1	50	900	Direct-connected to a 36-kilowatt 240-volt direct-current generator supplying energy to several of the original direct-current motors installed in this plant.
1	20	900	Belted to a line shaft driving one tire-setting machine; three tire-welding machines; one tire bender; two tire-equalizing rolls; three drills; one wheel-boring machine; and one hub-bolting machine.
1	5	1,800	Belted direct to mechanism of freight elevator.
1	10	1,200	Belted to a line shaft driving one rim sticker; one double spindle; one screw drill; three screw drivers; one small emery wheel; two post drills; one riveter; and two thread sanders.
1	15	1,200	Belted to a line shaft driving two wheel-rimming machines; two rim-polishing belts; one rim-pulling machine; one rim-bolting machine; one rim rounder; and one 16-inch cut-off saw.
1	10	1,200	Belted to a line shaft driving one wheel-rimming machine; two rim-polishing machines; one rim rounder; and two rim-bending machines.
1	15	1,200	Belted direct to a 40-inch exhaust fan.
1	35	1,200	Belted direct to a 60-inch exhaust fan.
1	2	1,650	Belted direct to a wheel press.
1	2	1,650	Belted direct to a wheel tenoner.
1	10	1,200	Belted to a line shaft driving one wheel-finishing machine; one wheel tenoner; one flange-starting press; and one compressing machine.
1	7.5	1,200	Belted to a line shaft driving two spoke-mitering machines; and one spoke-equalizing saw. This motor is large enough for only two of the three machines connected.
1	7.5	1,200	Belted direct to one spoke-polishing belt.
1	10	1,200	Belted to a line shaft driving one spoke-tenoning machine; one mitering machine; one spoke-throating machine; and one spoke facer.
1	20	1,200	Belted to a line shaft driving two 16-inch belt sanders; and two throat-belting machines.
1	15	1,200	Belted to a line shaft driving two 16-inch belt sanders; one polishing wheel; and two four-inch belt sanders.
1	15	1,200	Belted direct to a 40-inch exhaust fan.
1	20	1,200	Belted to a line shaft driving two rim-planing machines; and one rim welder.
1	10	1,200	Belted to a line shaft driving two rim-planing machines.
1	15	1,200	Belted to a line shaft driving one hub saw; one reamer; and one lathe.
1	7.5	1,200	Belted to a line shaft driving four hub mortisers; one emery wheel; one wood-turning lathe; and one small ventilating fan.
1	35	1,200	Belted to a line shaft driving two spoke lathes; one equalizing saw; and one 8-by-8-inch air compressor. This motor runs two of the above machines at a time.
1	15	900	Belted to a line shaft driving one 24-inch equalizing saw; one 14-inch cut-off saw; and one 16-inch rip saw.
1	5	1,200	Belted direct to one rim bender.
1	2	1,650	Belted direct to one 14-inch cut-off saw.

Woodworking Data—Sheet No. 2.

Woodworking plant making a line of high-grade store and bar fixtures. All work is done on order, no stock fixtures being made. Plant operates 60 hours per week in the busy season and 48 hours at other times.

Total connected horsepower, 170.5. Total number of motors installed, 32. Average kilowatt-hours per month. 4,999.

Kilowatt-hour consumption for 12 months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	2,790	May	4,100	September	6,400
February	3,560	June	5,000	October	5,860
March	4,400	July	4,340	November	6,520
April	5,100	August	6,600	December	5,320

Load-factor, 5.3 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	15	1,200	Belted direct to a 50-inch fan, running at 1,000 revolutions per minute.
1	3	1,800	Belted direct to one 12-inch rip saw.
1	3	1,800	Belted direct to one 24-inch face planer.
1	7.5	1,800	Belted to a line shaft driving one 30-inch Berlin planer, double drive; and one 12-inch cut-off saw.
1	5	1,800	Belted direct to one 14-inch rip saw.
1	15	1,200	Belted direct to one 9-inch sticker.
1	5	1,800	Belted direct to one 7-inch sticker.
1	2	1,800	Belted to a line shaft driving one 8-inch emery wheel; one knife grinder; one saw grinder; and one knife grinder for scraper.
1	5	1,800	Belted direct to one scraper.
1	5	1,800	Belted to drum of freight elevator.
1	3	1,800	Belted direct to tenoning machine.
1	5	1,200	Belted to a line shaft driving two 16-inch trim saws; and one 12-inch double emery wheel.
1	3	1,800	Belted direct to one mortising machine.
1	5	1,800	Extended-shaft motor belted direct to one two-head shaper.
1	3	1,800	Belted direct to one 10-inch face planer.
1	3	1,800	Belted direct to one 24-inch facer.
1	3	1,800	Belted to a line shaft driving two 10-inch rip saws.
1	2	1,800	Belted to counter shaft driving two lathes.
1	3	1,800	Belted to line shaft driving one 12-inch rip saw; one 26-inch resaw; and plating shop.
1	5	1,800	Belted direct to one 24-inch face planer.
1	10	1,800	Extended-shaft motor belted direct to one 36-inch planer.
1	3	1,800	Belted to counter shaft driving two cut-off saws.
1	3	1,800	Belted direct to lathe.
1	3	1,800	Belted to a line shaft driving one boring machine; one 10-inch belt sander; one dado saw; and one emery wheel.
1	3	1,800	Belted direct to one 36-inch band saw.
1	5	1,800	Belted to a line shaft driving one 36-inch band saw; one emery wheel, two boring machines; one jig saw; one bobbing sander; and one dish sander.
1	5	1,800	Belted direct to one grooving machine.
1	25	1,200	Belted direct to one 60-inch sander and 26-inch blower.
1	3	1,800	Belted direct to one two-head shaper.
1	3	1,800	Belted direct to one dove-tail machine.
1	3	1,800	Belted direct to one grooving saw.
1	2	1,800	Belted to line shaft driving one 36-inch band saw; and one 12-inch rip saw
1	2	1,800	Belted direct to one 12-inch rip saw.

Small woodworking establishment manufacturing wooden handles for picks, axes, etc. The average output is 10,000 dozen per month. Plant operates 10 hours per day.

Total connected horsepower, 46. Total number of motors installed, 10. Average kilowatt-hours per month, 2,676

Kilowatt-hour consumption per 12 months:

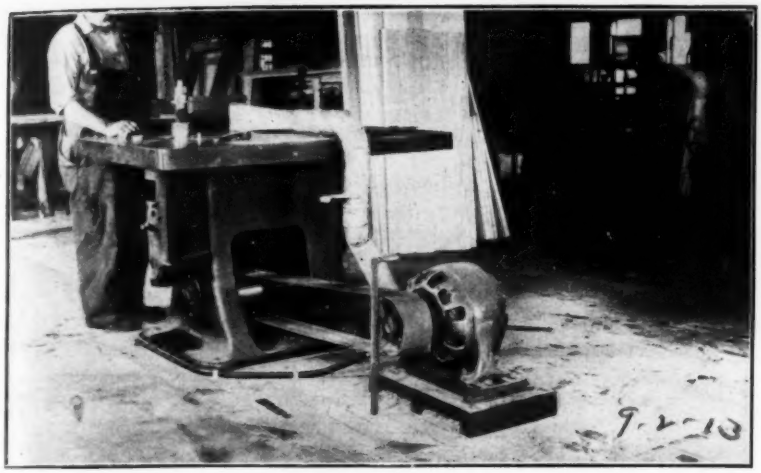
Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	2,790	May	3,100	September	640
February	1,580	June	510	October	3,590
March	1,740	July	1,261	November	4,520
April	3,550	August	2,060	December	6,780

Load-factor, 10.7 per cent; operating-time load-factor, 22.4 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase. 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M	Application.
3	5	1,700	Each belted to a 4-foot by 24-inch polishing machine.
1	2	1,700	Belted to a 12-foot countershaft driving two 24-inch cut-off saws.
1	10	1,200	Belted direct to a 36-inch rip saw.
1	5	1,700	Belted direct to a 24-inch rip saw.
1	2	1,700	Belted direct to a 14-inch cut-off saw.
2	5	1,700	Each belted direct to a 36-inch handle lathe.
1	2	1,700	Belted direct to an 18-inch cut-off saw.



Five-Horsepower Motor Belted Directly to Single-Spindle Shaper.

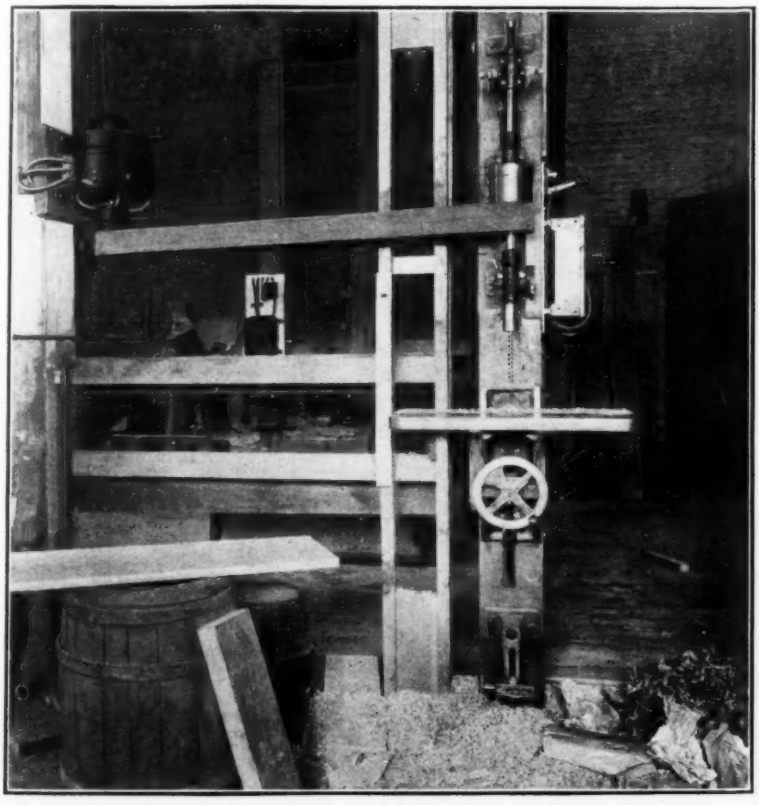
belt drive between engine and machine. It is not uncommon to find the machine at some distance from the engine running at 30 per cent less than its rated speed when the factory is carrying its average load. It is not feasible to speed this machine up 30 per cent as on light loads the speed would be so excessive as to cause rapid depreciation of the machine in question. As the output in the case of most wood-working machines is proportional to the speed, it is evident that motor drive would operate the machine at its maximum economical speed at all times, thereby increasing the output to what it should be. This is so important that the speed of each machine should be taken when the factory is running well loaded and when running light, and a comparison made with the speeds recommended by the builders of the machines. This data will serve as a basis for estimating the increase in output due to motor drive.

Determination of Energy Required.

The amount of energy required for motor drive is equal to the sum of the motor and wiring losses, the energy consumed in the mechanical connection between motor and machine, and the actual energy input to each machine. So much uncertainty attaches to the determination of the last-mentioned item that a detailed explanation is in order.

The loss of energy in the mechanical drive due to friction is rarely ever known. The difference between the indicated horsepower of the engine when operating the factory with machines loaded and when operating with machines idle is commonly taken as the actual power load. As a matter of fact the friction losses increase with the load sometimes being three times, and usually at least twice, the no-load friction losses.

The power requirements under load conditions can be measured with considerable accuracy. In case central-station power is accessible the following method can be used to advantage. The mechanical drive should be sectionalized and each section driven temporarily with an electric motor. The number and location of these motors depend on the distribution of the load. If the factory is of considerable size, and possibly several floors, at least one motor per floor should be installed and should be located near the center of gravity of the load. It may be advisable to divide the line shaft into two or more sections on some floors where the load is unusually heavy and is distributed on a long line shaft.



Motor Driving Boring Machine.

Advantages of Motor Drive.

Motor drive is of particularly great advantage to those plants where the output varies periodically. It should be kept in mind that when a small percentage of machines in a department are operated that the magnitude of the friction losses is many times that of the useful work, and that most of these losses would be eliminated by the use of motor drive. This is particularly true in overtime work.

A breakdown in the main part of the mechanical drive usually necessitates a complete shutdown of the factory. Trouble with motor drive is confined to one machine or to a group of machines.

Motor drive permits the most economical use of floor space. There is no need of a motor occupying floor space. On account of its compactness and smooth-running characteristics it may be mounted on the machine, placed under the machine, or attached to the wall or ceiling. The machines can all be located with regard to obtaining the maximum output, which can rarely be done when the machines must be driven from line shaft.

In many woodworking plants the number of holes in the floor through which belts pass to drive separate machines on the floor above have increased the fire risk. In case of fire each opening be-

comes a chimney which fans the fire and carries it from floor to floor.

Experience has proven that motor drive has decreased the number of accidents. Direct-connected motors; elimination of belts passing through the floors; stopping the motor quickly from several places about the machines, which may be done with very simple and inexpensive control apparatus, have all contributed toward decreasing injuries to employees.

It is evident that on account of the nature and characteristics of the manufacturing processes the induction motor is the most suitable for woodworking plants.

When accelerating machines have great inertia to overcome, such as heavy planers and matchers, as well as machines equipped with fly-wheels, such machines should be driven with motors having high-resistance rotors; and the remainder, with squirrel-cage induction motors.

Practically all woodworking machines, with the exception of lathes for special work, run at constant speed. The sparking of the direct-current motor makes this type of motor undesirable for this sort of work. Light weight, high-speed motors, involving lowest first cost, highest efficiency and power-factor are most desirable. The induction motor is well adapted for this purpose and its maintenance cost is somewhat less than for a direct-current motor. The squirrel-cage type of motor should be used whenever possible.

Mechanical Connection Between Motor and Machine.

Improper mechanical connection between motor and machine or motor and countershaft has in some instances caused unjust criticism of motor drive. For direct connection a flexible coupling should be used unless motor and machine are mounted on a common metal plate or the motor is attached to the frame of the machine. Most manufacturers of modern woodworking machines have so designed them that they can be readily adapted to individual motor drive. Chain drive or heavy belt with a spring belt-tightener is desirable when the motor must be located close to the machine but cannot be direct connected. Fly-wheels should be used on motors driving machines which have only peak loads of short duration. With all belt drives a belt speed of from 4,000 to 5,000 feet per minute is most satisfactory and economical. Pulley ratios of more than five to one under ordinary conditions should be avoided when possible by using lower speed motors. When it is desired to install a motor on a machine having a speed several times greater than that of the motor, gear drives using steel-cut gears and rawhide or cloth pinions have been successfully employed.

Commercial Practice
Management, Rates, New Business

COMPANY AND EMPLOYEE.

By W. M. Scott.

The relationship that should exist between a central-station company and its employees is a subject that is being given serious consideration by the progressive manager as he realizes that much of the success of his company depends upon the hearty co-operation of every employee. In the accompanying paper, which was presented recently before the Utah Light & Railway Company Section, N. E. L. A., Mr. Scott makes some very timely comments on this subject.

The objects and aims of the central-station company and its employees should be to the same end, viz: to get as great returns on their investments as possible consistent with fair treatment to all.

The owners should receive fair returns on their investments and all should work together to attain that end.

The public should get the best possible service at the lowest rates consistent with fair returns for the owners.

The employees of the company should in turn receive a fair compensation for their time and energy for making this possible, and if the interests of all are not mutual, there is something wrong somewhere that should be removed.

These results can best be obtained by being as closely associated as possible, and I know of no better way to become acquainted with each other and to know what the one expects of the other, than frequent company meetings.

There should never be a feeling between the company and its employees that one is ready to take advantage of the other. This feeling does sometimes exist, for the reason that there is too wide a gap; too little intercourse and too much lack of confidence between the higher officials and the rank and file.

In order to obtain the most efficient service in an organization such as ours, there must be implicit confidence between the heads of departments and those under them. In order to have this, care should be exercised in the selection of men; not only for the heads, but for any position.

I shall not attempt to name the essential qualifications of men for a successful organization in the order of their importance; but will name a few that are necessary for successful work: They are honesty, sobriety, industry, intelligence, good health, moral habits and a cheerful disposition. There are others that might be named; but these coupled with ambition will give a man a good start on the road to success.

As the company's interests are advanced, so should the employees' advance. Any employee who is satisfied with his present condition and has no desire to advance to a better one, is not worth while and is a detriment. If the best results are to be obtained he must have a feeling of assurance, that as he makes advancement and improves in his work, thereby making more for the company, that he will share in the profits of his labor, and this should be recognized and the advancement be made gratuitously.

Men are by no means equal; some are better adapted to certain kinds of work than others; they are sometimes more ambitious, more capable and more industrious than others, and are more entitled to advancement.

In order to obtain the best efficiency and as an incentive for men to improve in their service, advancements to better positions in the company's service should be made from the company's force. With proper care and judgment in the selection of men, it should be unnecessary to go outside of the com-

pany organization to get a man to fill any position in it.

The head of each department should have some man who could step into his place should he be called away temporarily, or be advanced and leave the department permanently. I have seen men who seemed to be afraid to let too much be known about their affairs, and disliked any one to be over ambitious for fear that they might get their job.

The interests of the company and its employees are, or should be, mutual, and what is good for one should be good for the other. In order to gain the good will, and thereby secure the most efficient service from the employee, it is necessary to take an interest in them, and give them some consideration other than the stipulated amount paid in monthly or daily wages. A few days' vacation, or a little outing or excursion will be appreciated more by a conscientious employee, than an advance in wages grudgingly given.

It should be the policy of the company to do everything that can be done to increase the bond between them and their employees. Their duties and surroundings should be made as pleasant as possible, so that there is a feeling such as exists in a big family, so that there will be no desire on the part of the employee to go elsewhere to look for work. Ideal conditions do not exist in an organization when the head of a department says that "He doesn't care if a man does quit, as it will be no trouble to get one as good." Conditions of wages, hours, surroundings and general treatment should be such that the best of men can be secured and retained. If the employees expect this consideration from the company, they must do their part to deserve it. They should be just as loyal to the company's interests as their own, and "Play Fair" with the company. If they go about their work with a feeling that they will do as little as they can and get as much as they can for what they do, they have no right to expect but what the company will get all they can and give as little as possible in return, and both will be losers. And if the boss is "on to his job," and has the interest of his company and himself at heart, as he should have, the employee who has such a feeling towards the company will soon be looking for another job.

As stated above, if a man expects the company to be interested in his advancement and welfare, he must "play fair" and be honest with the company, and should be just as attentive to his duties when left alone, as when under the watchful eye of his boss. A man who has to be constantly watched, or one whom you feel requires watching to be sure that he is doing his duty and properly executing what is delegated to him to do, stands little show of advancement. He has neither the interest of the company nor his own welfare at heart; but take a man in whom you have confidence and who you do not need to watch or worry about; knowing that his best energies are being exerted to promote both the company's and his own welfare, you will see that he is advanced from time to time to positions of greater responsibility and better pay, while the man who does have to be watched is at a standstill and his services are generally dispensed with at the first opportunity.

While I am not an advocate of dissatisfaction, and have little patience with those who are continually complaining of their job and their surroundings, and who are always jealous of someone else who has a better position than they have, and one who makes the claim outright or insinuates that so and so is a "pet," and his pay is raised, or he is advanced to better positions because he is a favorite; I do think that none of us should be satisfied to stay in the positions we are now in; but should qualify if possible to the highest position in the company's service, and be ready for advancements when the opportunities arise. I do not mean to convey the impression that an employee should not anticipate and receive advancements in his pay and other considerations that are advantageous to him, unless the opportunity should arise for him to fill a vacancy in a position higher than his own. On the contrary, the best and most efficient service is rendered when an employee works with a feeling of assurance that his earning capacity will be increased in proportion to the advancement he makes in the quality of his work, and the amount accomplished.

No man should ask or expect an advance in wages, or any special consideration from the company, unless he has improved in his services, and it should be unnecessary for him to have to call the attention of his superior to the fact that he has improved and is able to do more and better work, and that he should be recompensed accordingly. These facts should all be recognized and advancements made accordingly, and if done, both the company and the man would be the gainer.

The value of a man's services should be based on what he accomplishes, rather than on the position he holds, or the length of time he has been in the service of the company.

Loyalty and co-operation are essential for successful operation. So long as we are employees of the company, we should be loyal to their interests, their policy, methods and organization; refrain from criticism; but defend them at all times and under any circumstances.

There should be co-operation between the different departments and between the employees of any department and each do all they can to help the other make a success. We should not consider so much whether this move or that move is going to make a good showing for us as individuals, or for our department; but all get in and work together for what will be to the interests of our company, and if it is good for the company, it is good for us, and both will share in the profits.

We are fortunate in being associated with a company where conditions are as nearly ideal as they are. We enjoy a good many privileges that we could not enjoy elsewhere. There is no great desire on the part of the employees to break away from our home and seek another. It gives us pleasure to see the company prosperous, for we have a feeling that we are in a measure responsible for it. We may sometimes think the company has lost sight of our interest, that they could well afford to allow us a greater share of the revenues for our services. We may think that it has been a long time since there was any change in the amount of our pay check. If so, let us try and ascertain the cause. Perhaps we have not made any advancement, or improvement in our work, or if we have as individuals, perhaps the organization on the whole has not. Perhaps we are sometimes dilatory in getting down to work in the morning, unconsciously thinking that five or ten minutes will not make any difference. Perhaps we are watching the clock too closely and drop our work promptly at quitting time, when by staying a few minutes and completing a job, we would save an hour or two of some one else's time the following day, or perhaps save a day or two in a report or statement getting into the proper hands; or the same length of time in a customer getting service. Perhaps some of us may unthinkingly waste our time during working hours in telling funny stories or talking over some matter that has no connection with our work, and not only waste our own time, but the time of all who are in hearing. Let us check up and see if any of these apply to us; if so, let us "Cut it out," for all of these little things count for or against us. And on the other hand, let the company's officials and heads of departments make some observations and see whether the highest efficiency is being obtained, whether some are being held back on account of incompetence or inefficiency of others, and if there are

any weak spots, let us get together and strengthen them. Let us all work together for the interests of our company, with a feeling of assurance that we will share in the prosperity; for without that feeling of assurance, no man will exert his best energies. And bear in mind always that a greater effort will be made to please on account of the good will that exists towards the company and its officials, than through fear of the consequences of creating their displeasure.

Employees should not forget that their conduct is a reflection on the company. It is important that the employees as its representatives should remember that the policy and reputation of the company is judged by the treatment the public receives at the hands of its employees. Therefore, our treatment of the public should be the same as we would expect to receive if conditions were reversed, and our customer were representing the company and we were in his place. A discourteous reply to a civil question is sometimes the cause of a direct loss of a good many dollars to the company, which in a measure is our individual loss, for unless our company is prosperous we cannot expect to be.

Electric Light for the Poor Man's Cottage.

W. J. Fennell, borough electrical engineer of Wednesbury, England, has made a special effort to cultivate small cottage consumers. An account of the success which has already attended the effort was given by him in March to the Institution of Electrical Engineers at Birmingham. Wednesbury, like many English midland towns, is occupied as to nine-tenths of the area by industrial workers, the richer people living outside. Not even free wiring, coupled with the rateable-value system of charge or slot meters, would tempt householders of such rentals as $40 to $90 per annum to take a supply of electricity. Failing to reach what he terms the "lower middle class," Mr. Fennell turned his attention to the class below—the laborer, living in a cottage. Most industrial towns have hundreds or thousands of cottages and small houses occupied by these. They are places where the gas stove has no chance, as a fire is always kept burning in the living room; therefore lighting only is required. But if it is to be electrical there must be both free wiring and free lamps, as such consumers cannot afford 65 cents for a lamp, and if they used cheap carbon lamps they would soon want to install gas. Further, allowing a five years' life, a slot meter costs $2.50 per annum, while it is also a very unsatisfactory article and repairs or loss of revenue are heavy. A weekly payment system was felt by Mr. Fennell to be best suited to such a case, especially as this class of working man is generally noted for his weekly-payment habit for rent, clothes and furniture.

These small houses are in blocks and one service will supply from 5 to 15 houses. An ordinary 7/18 S. W. G. service is put into the most convenient house, terminating it in a service fuse, and space is allowed for fixing a meter if desired to check the consumption for each block. From the fuse a twin lead-covered cable is carried either inside or outside the houses, along the row, and is looped into each house. Where a house is not to be connected, a loop is left in the wire ready to insert when the tenant decides to come on. The cost of services averages $3.75 per house, whereas the usual cost for a few lights is about $16. The consequent saving of capital is important when comparing the value of small with ordinary consumers. Each house is provided with a wall-plug socket which takes the sub-service wires; the plug itself is connected by means of flexible wires to a pair of bow cutouts. This arrangement provides a double-pole fuse and switch ample for disconnecting a 120-watt installation, and Mr. Fennell says it is cheaper and less liable to corrosion, etc., than an ordinary double-pole switch. The wiring, which commences at the bow cutout, is quite ordinary. The cost of the wiring and fittings without lamps averages $7.25 to $8.10 per house. A local switch is at present allowed for each light, but the substitution of keyholders is being considered.

Mr. Fennell says that experiment is necessary to see whether the extra consumption is of more importance than the reduced cost of wiring. Three lamps are supplied, two 40-watt metal-filament (one for each downstairs room) and one 8-candlepower carbon lamp for the front bedroom. It is found that there is no demand for light in the other bedroom. As it is imperative to prevent any but authorized lamps being used, the simple expedient of using Edison screw caps and lamp-holders was adopted at Wednesbury, as lamps with this cap cannot be bought in England in small quantities, yet there is no extra expense for either holder or lamp because it is the Continental standard.

Estimates showed that an average of about 15 cents per week per house would easily cover all expenses, or $7.80 per annum, and the net profit has worked out at $1.80 per annum per consumer, or about 25 per cent of the income, "a far better return than on any other class of consumers."

Collection is carried out on a commission basis and it has been found satisfactory, a collector working insurance or other business, who knows just how to deal with this class of consumer, being engaged. Payment is made in advance on Monday or Tuesday, and the consumer is liable to be cut off on the Monday following a failure to pay.

The popularity of the scheme is unmistakable. Within 18 months the number of consumers has grown from 25 to 250. "It is quite usual for a poor woman to call for a few forms, say a dozen, and to bring them back again signed within a week."

Jovian Section in Indianapolis Newspaper.

At the time of the Jovian rejuvenation in Indianapolis, Ind., referred to in our issue of March 28, the *Indianapolis Star* published a four-page Jovian Section. This was in the issue of Friday, March 20. The first page of the section contained 46 portraits of prominent Jovians, including Governor Ralston and Mayor Bell, who were initiated at that time. Prominent among these was the portrait of Thomas A. Wynne, Statesman for Indiana, and candidate for Jupiter.

The other three pages of the section were devoted to reading material connected with the Jovian League or with electrical matters and with advertisements of an electrical nature. In this advertising the local utility companies, contractors, supply houses and manufacturers joined to fill an equivalent of two and one-half pages.

An Employees' Booster Club.

A recent meeting of the Employees' Booster Club of the Louisville & Northern Railway & Lighting Company and the Louisville & Southern Indiana Traction Company, held in New Albany, Ind., was addressed by F. T. Pawling, of Cincinnati, O., representing the General Electric Company, on electrical heating devices, stereopticon views and demonstrations accompanying the address.

James W. Dunbar, J. M. Merker, Henry A. Seigle and James Harman, officers of the two companies, made addresses on the subject of accident prevention, to which the traction companies operating "the big red cars" out of Louisville and into southern Indiana are now devoting considerable attention.

Fire at Decatur.

A fire which occurred on April 7 completely destroyed the office and sales rooms of the Decatur Railway & Light Company at Decatur, Ill. All records and other literature of the company were lost.

Electric Sign Data

Getting the Sign Business.

A. L. Scott, sales agent of the Edison Electric Illuminating Company, of Lebanon, Pa., interestingly recounts his experiences in endeavoring to promote a slogan sign in Lebanon, in a recent issue of the company's house organ. The suggestions contained in this article are worthy of serious consideration and are appended herewith.

To create a desire is the one aim of the salesman,—his most efficient weapon if used properly,—but when it comes to working up a desire for a sign slogan, he has to start at the beginning,—and it's a hard proposition to find the beginning,—and produce facts all the way through.

Realizing this fact, the writer, in an effort to influence the public sentiment in favor of an electric sign slogan for the City of Lebanon, started in with the secretary of the Board of Trade, who at first did not feel any too kindly toward an electric sign for the City, but, upon being shown how cities considerably smaller than Lebanon were going ahead and doing things in a modern way,—his civic pride burst forth and with it, that desire to have his city also put on the map as being progressive.

After the first talk he realized that the Board of Trade was the proper channel through which to work to get plans laid for an electric sign slogan, so he invited the writer to attend the next meeting of the Board and take the matter up with them.

Understanding that he must do something more than tell them about other cities, the writer set about laying his plans. With only a few days left before the meeting of the Board of Trade, he hit upon a plan to get some data which might appeal to everyone attending, and particularly to those not well informed on the value of electric signs in general. A booklet entitled, "Sure Sign of Success," "Will Interest Only Progressive Citizens," was the result.

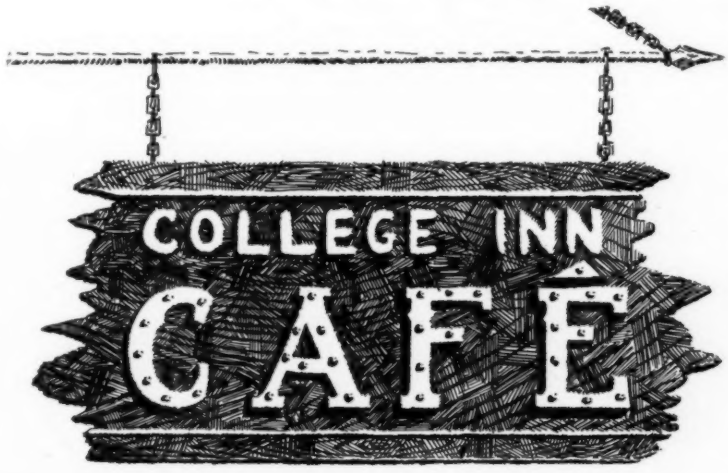
The books were handed out at the meeting, which was fairly well attended, although it was not generally known that an electric sign slogan proposition was to come up for discussion. Directly after the reading of the minutes by the secretary, the writer was called upon to tell them about Lebanon's having an electric sign, which, however, he did not do. He explained and showed them how other cities were growing through their modern methods,—trying to convince them that modern methods have power to boost any city, and at the same time, work up that much sought for "desire."

Something must have been accomplished along this line, for the entire evening was spent in the discussion of electric signs. During this discussion, the writer tried to kill two birds with one stone. Without straying too far from the line of attack which he had planned, he brought out also the value of the electric sign to the merchant. He told what other cities were doing, produced reasons for city slogans, and explained how merchants and men in various lines of business were increasing their business through up-to-date city and personal advertising, particularly electric sign advertising, while they,—the Lebanon business men,—were waiting for John Jones or Tom Smith to make the start and get a sign before they came out and announced to the public that they had decided to modernize their methods and progress to the extent of erecting a sign.

Upon expressing his willingness to answer questions, the writer was surprised to hear practically each one in attendance present two or three of them, opening up to him an opportunity to offer suggestions on sign slogans, merchants' signs, window lighting, and advertising in general.

It was interesting to note, after showing them how far behind the times the merchants were compared to those in other cities, especially in the matter of advertising, how they popped questions regarding the cost of installation and operation of signs, which as far as possible, were eluded, this not being the real object of this discussion. To convince them of the benefit to be derived from the latest, and, therefore, the most modern method of advertising, and the desirability of both the city and the merchants getting in line to promote the interests of both through this medium, was the great aim of the evening.

On a motion of the board, the writer was asked to call personally on all the absent members of the board, and on other business men for the purpose of obtaining their views and arousing interest in a proposed sign meeting.



Sign sketch for cafes and restaurants, contributed by the Greenwood Advertising Company, Knoxville, Tenn.

Sign measures 85 feet by 325 feet. There are 64 receptacles, the sign being double face.

Letters are 16-inch raised, full block with background of imported glass smalt.

The sign is of mission design and lends itself readily to any color schemes and flashing effects.

Electrical Construction

Revised Electrical Rules of Chicago.

The rules and regulations of the Department of Gas and Electricity of the City of Chicago, governing the installation of wires and apparatus for electric light, heat and power, and for the construction and installation of electric signs and displays, have been revised and published as a paper-bound book, copies of which may be had from the city clerk of Chicago for 10 cents each. The revision has been brought about chiefly through the efforts of Victor H. Tousley, chief electrical inspector, and under the general supervision of Ray Palmer, commissioner of gas and electricity. The last edition of the rules, that of 1912, formed a 207-page book, while the edition of 1914 contains 244 pages.

At the beginning of the revised book of rules are published the revised city ordinances governing electrical inspection in general (including the registration of contractors), illuminated signs, electrical construction in streets and alleys; also the electrolysis ordinance, the ordinance specifying the three standard types of electric street lamp posts, and the ordinance governing the examination and licensing of moving-picture operators and apprentices.

The Chicago rules follow very closely the rules of the National Electric Code. There are, however, certain variations and more stringent regulations which are necessitated by local conditions. Electrical work done in compliance with the Chicago rules will be accepted by the Board of Underwriters.

The principal changes and additions to the rules are given below. In each case there is given the subject matter and the nature of the change or addition. Specially important changes are given in full.

Rule 1*d*.—Protection of Constant-Potential Direct-Current Generators.—New rule in place of second and third paragraphs, to correspond with National Electrical Code, 1913 edition. Permits single-pole protection for two-wire generators.

3*e*.—Switchboards.—New additional rule; corresponds with National Electrical Code. Gives details on protection of large numbers of rubber-covered wires.

4*a*.—Resistance Devices.—Sheet asbestos and mill board not approved for mounting resistance; slate, marble or transite board, not less than one-half inch thick, must be used.

4*b*.—Resistance Devices.—Additional paragraph; corresponds with National Electrical Code. Permits use of incandescent lamps for resistances under certain conditions.

8*k*.—Motors.—New additional rule; corresponds with National Electrical Code. Deals with soft-rubber bushings for the protection of wires where they leave the frame.

Class B.—Outside Work.—Note at top of section changed to correspond with National Electrical Code. Restricts Class B rules to such portion of the installation as is not protected by service cutout and switch.

12*b*.—Underground Wires.—New sentence added to second paragraph. Requires use of lead-covered wire for underground service leads.

12*f*.—Service Conduits and Wires.—Second paragraph changed to allow service conduits to be imbedded in brick or concrete walls. Also new additional paragraph requiring service outlets to be so placed as to maintain proper clearance between light and signal wires, both where attached to building and between building and pole.

15*b*2.—Grounding Low-Potential Circuits.—The word "may" changed to *must*, to correspond with National Electrical Code. This rule now requires the grounding of one side of alternating-current secondary circuits, even where no neutral point is accessible.

15*g*.—Grounding Transformer Secondaries.—New specifications to correspond with National Electrical Code, but omitting last paragraph in fine print of latter.

16*b*.—Tie Wires.—Change in first paragraph to correspond with National Electrical Code. Allows use of marlin and similar materials for this purpose.

17*d*.—Underground Conductors.—New rule; requires use of lead-covered wires in underground conduits.

18.—Allowable Carrying Capacities of Wires.—New tables of carrying capacities for rubber and other insulations, to correspond with National Electrical Code.

20-22.—Series Arc Systems.—New subtitle at head of section. For inside lighting series arc systems to be allowed only by special permission.

23*a*.—Service Cutouts.—New specifications to insure location in accessible position and near to service entrance.

23*d*.—Branch Circuits and Cutouts.—Important changes in loading of branch circuits. New rules are as follows:

Must be so placed that no set of small motors, small heating devices or incandescent lamps, whether grouped on one fixture or on several fixtures or pendants (nor more than 16 sockets or receptacles) requiring more than 660 watts, will be dependent upon one cutout.

On new installations which are to be occupied as apartments, residences, offices or stores a sufficient number of circuits must be provided to allow for at least one watt per square foot of floor space. The floor space to be determined by the total floor area including partitions. For stores separate circuits must be provided for the show windows.

By special permission, in cases where wiring equal in size and insulation to No. 14 B. & S. gauge *standard* rubber-covered wire is carried direct into keyless sockets or receptacles, and where the location of sockets and receptacles is such as to render unlikely the attachment of flexible cords thereto, the circuits may be so arranged that not more than 1,320 watts (or 32 sockets or receptacles) will be dependent upon the final cutout.

Except for signs and outline lighting, sockets and receptacles will be considered as requiring not less than 40 watts each.

All branches or taps from any three-wire system which are directly connected to lamp sockets or other translating devices, must be run as two-wire circuits and both wires of such branch or tap circuits must be protected by proper fuses.

The above shall also apply to motors, except that small motors may be grouped under the protection of a single set of fuses, provided the rated capacity of the fuses does not exceed 10 amperes.

When 1,320 watts are dependent upon one fusible cutout, as is allowed in theater wiring, outline lighting and large chandeliers, the fuses may be in accordance with the following table:

125 volts or less.....20 amperes
125 to 250 volts.....10 amperes

The first, third, fourth, sixth and seventh paragraphs above correspond to the first, second, third and fifth paragraphs of the National Electrical Code rule 23*d*.

24*a*.—Service Switches.—Additional specifications in first paragraph to insure proper location and connection of service switches.

24*b*.—Double-Throw Switches.—Addition to first paragraph to correspond with National Electrical Code. Requires double-throw switches that are mounted so that the throw is vertical to be so constructed that the switch will remain in the open position when so set. (*This rule will go into effect June* 1, 1914.)

24*c*.—Single-Pole Switches.—Single-

pole switches will be allowed for the control of 660 watts in branch lighting circuits in place of 330 watts, as heretofore.

24*d*.—FLOOR BOXES.—First paragraph changed to conform to National Electrical Code. Additional paragraph gives specifications on floor outlet boxes designed for use with both light and signal wires.

25*a*.—HEATERS.—Rule changed to allow heaters of 660 watts or 6 amperes or less to be used on lighting circuits with certain restrictions. Heaters taking over 660 watts must have separate cutout and indicating switch or connector.

26.—OPEN WORK.—Important prohibitory rule as a subtitle to section on low-potential systems, as follows:

After June 30, 1914, open work (wiring on porcelain knobs or cleats) will be prohibited. Exception to this rule will be made for wiring in locations where excessive moisture, acid fumes or corrosive vapors exist; or where the installation of other approved forms of construction is impracticable, in which case special permission in writing must be obtained previous to starting the work.

26*d*.—CONDUIT FITTINGS FOR MOTOR WIRING.—Additional paragraph specifying location close to motor.

26*k*.—WOOD MOLDING.—Important prohibitory rule at head of this section, as follows:

After June 30th, 1914, the installation of wires in wooden molding will be prohibited.

26*l*.—METAL MOLDING.—Revised rule to correspond with National Electrical Code. Gives new specifications allowing metal molding to extend through partitions without additional protection; also allows 1,320 watts in metal molding.

27*b*.—OUTLET BOXES FOR ARMORED CABLE.—Changes in third paragraph to correspond with National Electrical Code. Gives specifications on the installation of outlet boxes.

27*c*.—GROUNDING OF ARMORED CABLE.—The words "ground plate" in the third line changed to *grounds*.

28*d*.—OUTLET BOXES FOR INTERIOR CONDUITS.—Third paragraph changed to correspond with National Electrical Code. Gives specifications on installation of outlet boxes similar to 27*b*.

Also two new paragraphs added. Require outlet boxes to be covered in all completed installations. Boxes must be provided with either fixture studs or ears for the fastening of covers. Boxes must be fastened independently of the conduit.

28*i*.—FASTENING CONDUIT.—New rule added requiring conduit to be fastened to brick, tile and similar walls by means of toggle bolts or expansion bolts. Nails or screws driven into wooden plugs will not be approved.

28*j*.—CONDUIT IN WET PLACES.—New rule requiring that conduit systems in wet places be arranged to drain.

29*b*.—METAL MOLDING.—Second paragraph changed and new third paragraph added to correspond with National Electrical Code. Specifications on installation of metal molding where passing through floors and partitions.

32*e*.—CORD IN SHOW WINDOWS.—Rule altered to allow the use of rubber-jacketed, reinforced cord in show windows and show cases in place of the metal-armored cord previously required. This rule also allows the use of ordinary flexible cord in chain fixtures in show windows.

36*c*.—TRANSFORMERS.—Amended to correspond with National Electrical Code. Allows approved bell-ringing transformers to be mounted directly on woodwork.

38*C*.—GARAGES.—Important new rules on the electrical installations in garages, as follows:

All wires and electrical apparatus installed in buildings or parts of buildings wherein are housed for use, rent, care, demonstration, storage or sale, one or more self-propelled vehicles or wheeled machines containing in tanks thereof volatile inflammable liquid for fuel or power, also all parts of buildings and all adjoining structures or buildings not separated from the garage proper by fire walls or floors, having openings, if any, protected by fire doors, shall conform to the general requirements of this Code and in addition thereto must conform to the special rules herein given.

a. All wires, except such as are required for pendent lamps or portable connections, must be installed in standard conduit, armored cable or metal molding.

b. Flexible cord for pendent lights must be standard "portable cord" (Type Letter PWp) as provided for in No. 54.

c. Flexible cord for portable lights, motors or other apparatus must be standard cord designed for rough usage (Type Letter PWp or T) as provided for in No. 54. The portable cord must carry the male end of a pin plug connector, or equivalent, the female end being of such design or so hung that the connector will break apart readily at any position of the strained cable. The connector must be kept at least four feet from the floor.

d. Flexible cord for charging must be standard theater cable (Type Letter T) as provided for in No. 54. This cable must carry the female end of a pin plug connector, or the equivalent, of at least 50 amperes capacity, the male end being of such design or so hung that the connector will break apart readily at any position of the strained cable. The connector must be kept at least four feet above the floor, and the male end, if not located on switchboard or charging panel, must be shielded against accidental contact.

e. Cutouts, switches, receptacles and sockets, which are permanently located, must be placed at least four feet above the floor.

f. For all portable lights, and all other lights located within four feet of the floor, standard vaporproof receptacles specially designed for this purpose must be used. For portable lights the vaporproof receptacle must be protected by a substantial lamp guard.

g. Switchboards and charging panels must be placed at least four feet above the floor or must be located in a room or enclosure provided for this purpose.

h. Motors or dynamos, not actually a part of a vehicle, shall be located at least four feet from the floor.

i. No battery shall be tested except by means of a voltmeter.

j. Garages containing electrical machines only, must conform to the above rules as far as they apply, except that vaporproof receptacles will not be required and electrical apparatus may be located any desired distance from the floor. The switchboard or charging panel must be enclosed or otherwise suitably arranged to protect it from mechanical injury. In private garages the charging panel must be enclosed in a compartment so constructed that access to same cannot be obtained by unauthorized persons.

39*b*.—WIRING FOR OUTLINE LIGHTING.—Rule changed to require conduit systems to be installed so that they will drain; also to require the use of special fittings; open work will be allowed only by special permission.

45*c*.—GROUNDING OF TRANSFORMER CASES.—Revised to correspond with National Electrical Code. Rule now requires the grounding of the cases of high-potential transformers.

50*d*.—TESTS OF RUBBER-COVERED WIRE.—Table of multipliers for temperature correction changed to correspond with National Electrical Code.

54.—FLEXIBLE CORD.—Gives additional specifications for flexible cords of all classes, closely coinciding with those of the National Electrical Code.

58.—METAL CONDUITS.—Gives additional specifications for both rigid and flexible metallic conduits to correspond with National Electrical Code.

65.—SWITCH CONSTRUCTION.—Gives additional specifications for both knife and snap switches to correspond with National Electrical Code.

70.—CABINETS.—Gives additional specifications covering construction to correspond with National Electrical Code.

76.—INSULATING JOINTS.—Gives additional specifications for construction to correspond with National Electrical Code.

81.—TRANSFORMERS.—Gives additional specifications for construction of air-cooled and bell-ringing or other signaling transformers to correspond with National Electrical Code.

Program of Iowa Electrical Contractors' Association.

The annual convention of the Iowa Electrical Contractors' Association will be held in Cedar Rapids, Ia., April 22 and 23, partly in conjunction with the Iowa Section, N. E. L. A., whose convention will be held on the same dates.

The following tentative program has been announced.

Wednesday, April 22, 10 a. m.—Address of welcome, John Wunderlick, Cedar Rapids; response, George O. May;

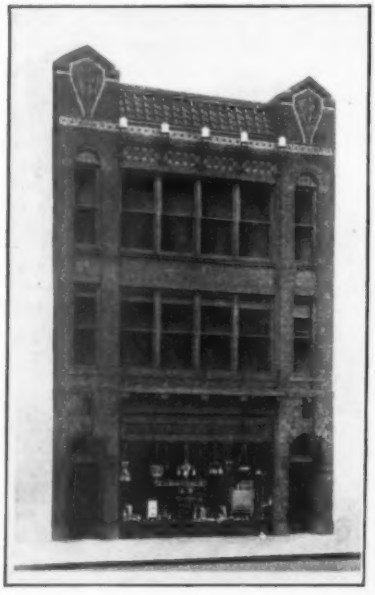
address of the president, M. McCarten; paper, "Modern Business Methods Applied to Electrical Contracting," by Ed. Kunkel, Davenport. Afternoon session, 1:30 p. m.—Paper, "Co-operation Between Contractors and Central Stations," by J. T. Marron, Rock Island, Ill.; paper, "Our Compensation Law and Its Application," by George A. Wrightman, Des Moines.

Thursday, April 23, 10 a. m.—Paper, "Uniform Plans and Specifications," by Floyd A. Wallace, Des Moines; paper, "A System of Bookkeeping for Electrical Contractors," by W. J. Ball, Moline, Ill. At 1:30 p. m. interurban cars will leave for trip to Iowa City to visit the state university, where a paper on "High-Tension Lightning Protection" will be read by Arthur H. Ford.

The entertainment features will be the same as for the electrical association.

New Store and Office Building of The Sanborn Electric Company.

The Sanborn Electric Company, contracting engineers, Indianapolis, Ind., has recently built a new fireproof store and office building which is designed to meet both the present and future needs of the company.



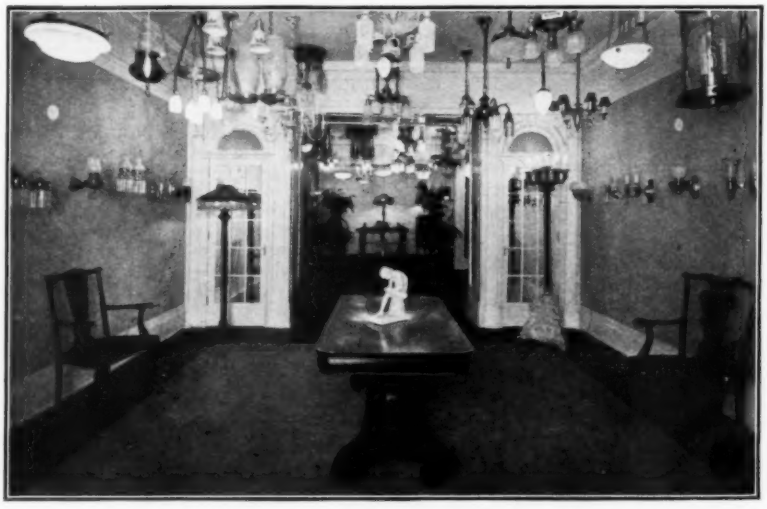
Store and Office Building of Sanborn Electric Company.

Fig. 1 shows an exterior view of the building. The front portion of the first floor is arranged to display attractively, a large line of electric stoves, washing machines, electric cleaners, cooking devices, and, in fact, "Everything Electrical.'

Glass floor and wall cases are provided for the exhibition of merchandise. These cases are well lighted and the nickel and copper devices make a very attractive exhibit. By keeping these devices under glass, they are prevented from tarnishing and becoming dirty and are hence always fresh and attractive to the customer. One section of the wall is arranged with eight swinging display cases which are about four inches deep, two feet wide and five feet high, their backs being covered with black felt over which is placed glass. Small articles such as switches, receptacles, cutouts, Mazda lamps, flash lights, etc., are mounted on the backs. Immediately behind the cases are shelves which contain the goods that are displayed. This method permits the displaying of a class of merchandise which is generally hidden away in shelving, and the fact that it is in plain sight often suggests to the customer that he is wanting such an article.

The customer passes from this department to what appears to be the front porch of a residence, from which one enters a vestibule leading into a large reception hall. From there the visitor is conducted into an English reception room, which, in turn, opens into a fully equipped library furnished in colonial style. There is also a French room, and this in turn, opens at the rear into a solarium. The lighting fixtures shown in these rooms are suggestive of the periods of decoration represented in the different apartments; the whole being designed to give the public a clear impression of how the fixtures will appear when installed in their own homes.

Retail Display Room.



Colonial Room in Lighting-Fixture Department.

A feature of these fixture showrooms is that every fixture is wired and lighted individually, there being a definite number of outlets on the ceiling, to prevent the crowding of fixtures. The fixtures are spaced a sufficient distance apart to show each one to the best advantage. Lighting fixtures for all classes of buildings are displayed.

The upper floors of the building are

used for general and private offices, engineering department, etc., while a large basement affords storage and shop facilities.

There is a rear entrance for employees, which brings the construction men to the construction superintendent's desk by the shortest course, and is so arranged that it is not necessary for the construction men to pass through the retail department with tools, ladders, etc. An employees' room is conveniently located in the basement for the use of the construction force. A lunch table, lavatories, shower baths, etc., as well as proper facilities for their tools and clothes, are provided.

The Sanborn Electric Company has been in the electrical contracting business for the past twenty-three years. Their operations have extended to various parts of the country, one of their recent large contracts being the new three-million-dollar Michigan Central Railroad terminal station and office building in Detroit, Mich. The entire electrical equipment, including the lighting fixtures, was furnished by this company.

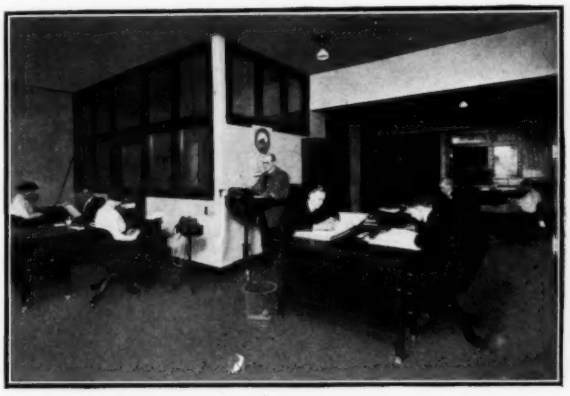
G. M. Sanborn, president of the company, is optimistic as to the future of the electrical contracting and retail business. He firmly believes that the public are ready for electrical stores and that it only remains for the contractor to develop this side of the business. The electrical contractor is the logical and natural retailer for the material and he is better qualified to handle and develop this business than a lighting company, or any other branch of the trade. However, he must seize the opportunity. If he does not make the proper investment and display, and does not fully prepare himself to handle the retail trade, he must not complain if the lighting company or someone else does it. If the contractor takes his proper place in the field, others will naturally leave the business to him. The lighting company should realize that the contractor needs encouragement to invest his money in an untried venture and should refrain from offering undesirable competition to the contractor, but should lend him every assistance and encouragement to develop a field which will be of mutual benefit.

Much has been said of co-operation, but it should be remembered that co-operation with the contractor must be of the kind that allows him to make a profit while selling devices, which also means more business for the lighting company.

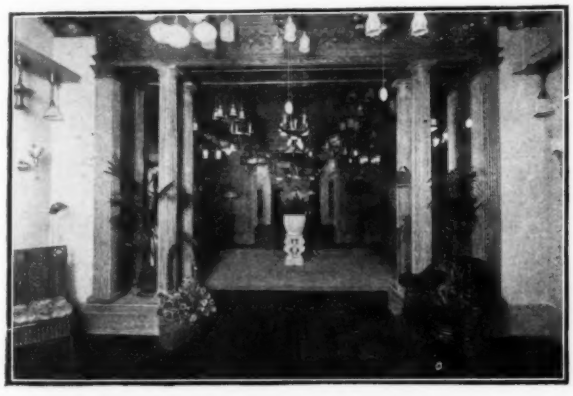
Mr. Sanborn was president of the National Electrical Contractors' Association during the years of 1909 and 1910, and is at present a member of the executive committee. He was chairman of the committee which developed the standard symbols for wiring plans, the Universal Data and Sales Book and the charts showing standard sizes of conduit for wires and cables.

The Sanborn Electric Company is a member of the Society for Electrical Development and has reproduced in its showroom the emblem and slogan of the Society. Mr. Sanborn is a member of the Board of Directors of that Society and believes firmly in its future.

President's Office.



General Offices.



Vista Through Lighting-Fixture Department.

Engineering Department.

Electrical Rules in Grand Rapids.

The city of Grand Rapids, Mich., has separate ordinances covering the installation of indoor and outdoor wiring, as also an ordinance governing the erection and maintenance of electric signs. The chief electrical inspector of Grand Rapids is George Cotton.

It is provided that no electrical work shall be installed except by persons holding licenses issued by the Board of Police and Fire Commissioners upon recommendation of an examining board, but no fee is charged for such licenses. The fees for inspec-

tion depend upon the size of the installation, the minimum being 50 cents for less than 12 lamps or a motor of less than one horsepower. The fee increases with the number of lamps, being $6.00 for 200 to 300 lamps, and $1.00 additional for each additional 100 lamps. The fee for motors exceeding eight horsepower in size is $3.00; for generators less than two kilowatts the fee is $1.00, increasing to $5.00 for sizes above 20 kilowatts.

It is especially provided in the ordinance that the municipal inspection and the issuance of a certificate shall not relieve the responsibility of owners or contractors from damages caused by any defect.

Conduit or steel-armored cable is required within the fire limits of the city and also in all churches, theaters, other public buildings and unfinished basements of apartment houses.

The National Electrical Code is enforced with a few additional supplementary rules. Cabinets are required for main switches and cutouts. All conduit must be grounded with approved ground clamps to water pipes and grounding upon gas pipes is not permitted. Conduit is required between meter and cutout cabinets. Wooden molding is not allowed. Bell transformers are required to be installed on meter boards with fuses.

The ordinance covering outdoor work requires that wires on opposite sides of poles shall be at least 26 inches apart except in the case of telephone and signal wires. Wires of voltages higher than 600 volts must be at least 72 inches from low-voltage wires. Guy wires must contain two strain insulators, nine to eleven feet from each end. Wires running vertical on poles must be incased in wood or other insulating material for four feet on each side of a point of crossing other wires. Where light and power wires cross other wires on cross-arms the minimum allowable clearance is 18 inches. Cross-arms carrying three or more wires must have iron braces. All wires except trolley wires must be at least 15 feet above the ground at every point. Power wires on the same cross-arm must be 14 inches apart. Except on polyphase circuits not more than one transformer is permitted on one pole. Where high-potential wires (7,500 volts or over) cross other wires or run on the same poles, the high-potential wires must be above the other wires and have a clearance of six feet. Outside construction may be done without permit only in cases of emergency, and in such case permit must be secured within 48 hours.

The following general suggestions are made. In all electric work conductors, however well insulated, should always be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short-circuit occur, and so that all leakage from conductor and ground may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors, and securing and attaching of fittings are specially conducive to security and efficiency, and will be strongly insisted on.

In laying out an installation, except for constant-current systems, the work should, if possible, be started from a center of distribution, and the switches and cutouts, controlling and connected with the several branches, be grouped together in a safe and easily accessible place, where they can be readily got at for attention or repairs. The load should be divided as evenly as possible among the branches, and all complicated and unnecessary wiring avoided.

The use of wire-ways for rendering concealed wiring permanently accessible is most heartily indorsed and recommended; and this method of accessible concealed construction is advised for general use.

Architects are urged, when drawing plans and specifications, to make provision for the channeling and pocketing of buildings for electric light or power wires. All services should be located so as to avoid long drops and extra brackets on the house.

LETTER TO THE EDITOR.

Comment on Kinks.

To the Editor:

The Wiring Kink of Charles Harris in April 11 issue is an old method that is mentioned in several telephone books. It is understood that the last wire will test open in making this test. Should it happen that any of the other wires were open, a trip to the other end of the cable is necessary before the test can be completed. On account of the capacity in cables it is better to use a bell rather than a receiver in making this test. With a 250-foot cable I have been able to receive a click from several of the wires at a time, that from the right one being no louder than the others.

The method of taking up slack by B. H. Fisher, in the issue of January 31, would be inefficient because the constant vibration would tend to loosen the lag screw in the wood. Use the "cheaper in the end" and more efficient methods.

H. E. Weightman.

Chicago, Ill., April 11, 1914.

Fixture Costs.

In our shop we list the cost of each item that goes into making up fixtures on standard five-by-eight-inch cards, which are suitably indexed for reference and arranged in order.

In the file these are classified under the headings One-Light, Two-Light, Three-Light, Four-Light, Miscellaneous, and Special. Cards having these designations are used as index cards in the card file.

We buy most arm fixtures ready for assembling, but make up our own showers, etc., as we find we can make up a greater number of styles of fixtures from a comparatively small stock of parts than by getting these fixtures complete. We list all parts such as pans, chains, loops, etc., and use the form shown in Fig. 1 for finding the cost of each fixture. The cost of the fixture

Fixture—One-light link pendant—pan-bowl fixture, XXX.		
Canopy, 1	@	12
Crofoot, 1	@	2
Pipe stem, 1	@	4
Hickey, 1	@	5
Casing, 6 in., @ 15c		8
Wire (cord), 2 ft. @ 1c		2
Sockets—key (pull), 1	@	30
Socket-covers, 1	@	20
Shade-holders, XXX		
Loops, single, XXX		
Loops, double, 1	@	20
Finishing rings, XXX		
Chain, XXX		
Hooks, XXX		
Nuts, XXX		
Bottom Knobs, XXX		
Insulating joint, XXX		
Special—misc., XXX		
Labor fitting		30
Total cost		**$1.33**

Fig. 1.—Sample Card.

without glassware is marked on the tag in code letters, as is also the selling price. This is done so that any kind of glassware can be put on the fixture and an accurate price given for it.

These forms have a short description of the fixture at the top and are filed away under proper classification for reference at a future time. In this way any special fixture will always have its record readily available and a fixture of like construction can have its price quoted. We find this an accurate and labor-saving method of handling the fixture business.

It will pay any one who has much of this to do to put in a show room which can be darkened to show fixtures under artificial light. Shades show up much better under this condition and a better class of goods can be sold if they are properly displayed. Our trade was en-

tirely along cheap arm fixtures until we built our show room; now we sell a better grade of fixtures and shades, for which we found no market before. They sell very readily now that we can display them to good advantage.

E. M. Raetz.

Electrical Inspection in Oregon.

A joint meeting of local sections of the American Institute of Electrical Engineers and the National Electric Light Association was held at Portland, Ore., on April 7. F. D. Weber, electrical inspector of the Underwriters' Equitable Rating Bureau, Portland, presented a paper entitled "Is Underwriters' Inspection Necessary in Oregon?"

In this paper Mr. Weber pointed out the enormous annual fire loss in the United States and Canada, which he contrasted with the relatively small figures of European countries. He touched on the causes of fires and dwelt particularly on the fire hazard of electrical installations and apparatus, which was the fundamental reason for the formulation of the National Electrical Code. Taking up the educational and other work being done to decrease the fire hazards and therefore fire losses, he touched on the work of the Underwriters' Laboratories and the National Board of Fire Underwriters.

In Oregon the Underwriters' Equitable Rating Bureau has been organized under the insurance laws of the state. This Bureau maintains an electrical department as part of its activities. In the city of Portland this electrical department endeavors to maintain supervision over all new electrical installations except dwellings. Outside of Portland it has been making thorough inspections in all buildings except dwellings in all of the larger cities and towns in Oregon. This inspection also includes the inspection of booths in moving-picture theaters, motion-film exchanges and private and municipal fire-alarm systems throughout the state. The methods pursued in the electrical inspection work were described by Mr. Weber in detail, together with the reports based on this work.

The following Oregon towns now have ordinances and inspection by local inspection departments: Hillsboro, Ashland, Medford, Grants Pass, Albany, Salem, Astoria, Eugene, Roseburg, Marshfield, Klamath Falls, Portland, Dallas, Independence, Sheridan. The city inspection departments are a great aid in getting the proper installations, when efficiently administered, as they are generally given police power and therefore can get immediate correction, while the Bureau can only make a penalty charge in the rate. Also the immense amount of detailed work necessary to carry on inspection in the residence district should be carried on by the municipality as a police duty, supported by the money collected by the fee system for inspections or by money out of the general fund, because the Underwriters do not feel that they can afford to do this work without charging for same and if they do charge they have no authority to collect the fees and have no police authority to get enforcement.

Louis B. Van Nuys.

Among the electrical contractors of Peoria, Ill., the Central Electric Company has a prominent place. This concern is located at 238 South Jefferson Avenue and its president is Louis B. Van Nuys.

Mr. Van Nuys was born in Peoria and has been in the electrical construction business there for 16 years, during which he has handled all classes of work from wiring old houses to power-plant construction. He at one time operated under the name Peoria Electric Company, but sold out this business and went to Chicago. Returning at a later date he took charge

Louis B. Van Nuys.

of the store of the Central Electric Company, which was at that time under a different ownership. He later became connected with the construction end of the business and now holds a master electrician's license from the city inspection department. Over a year ago Mr. Van Nuys and Charles D. Brainard bought control of the Central Electric Company, as the former owners were desirous of retiring. Mr. Van Nuys was made president and general manager of the company, a position which he now occupies, while Mr. Brainard became secretary and treasurer. The business has been continued under the old name and is being extended with great energy and enterprise. It covers the sale of fixtures and supplies as well as electrical contracting.

Mr. Van Nuys is a member of the national and state contractors' associations and is vice-president of the Peoria Electric Club.

Among the Contractors.

The Edmunds Electric Construction Company, of Ft. Wayne, Ind., has increased its capital stock $13,000 with a view to enlarging its business.

Electrical contracts for the nurses' building, administration building, and the kitchen and laundry at the new Ohio State Hospital for the Criminal Insane have been awarded to the McKeever Electric Company, Columbus, O. This contract comprises the wiring and lighting equipment and calls for an expenditure of $3,700.

H. H. Carr, of Columbus, O., has been named as general contractor for the erection of 170 booths to be erected about the State House Square of that city, in connection with a "Made-in-Columbus" exhibition to be held June 8 to 14. The grounds to be inclosed are a square of ten acres. The electric wiring and light equipment is estimated at $1,500, or about one-third of the entire cost of the booths.

The Churchill-Warner Company, of Roseburg, Ore., of which F. B. Warner is manager, has the contract for the electrical work and fixtures for the new county hospital in that town. This company has also recently completed the wiring of the new Ford garage in Roseburg.

The Comet Electric Company, of Eugene, Ore., has recently completed the installation of lighting fixtures in the new Oregon Electric Railway station and also the installation of wiring and fixtures in the new Bartle-Sweaney Courts apartment building. One of its recent motor installations was that at the Eugene High School where seven motors were installed for manual-training work.

C. C. Cowles, electrical contractor, of Red Bluff, Cal., has been awarded the contract for the ornamental street-lighting system to be installed for the city of Red Bluff for a distance of four blocks on Walnut Street. Work is expected to commence at once.

F. M. Grant, of Cleveland, O., has sold his interest in the firm of Harrington and Grant and has opened an office at 1529 Prospect Avenue under the name of The F. M. Grant Electric Company. The new place is stocked with a full line of construction material and new tools and equipped with an auto truck for deliveries.

The contract for the electrical work on the G. W. Bobb wholesale grocery building, six stories and basement at Columbus, O., has been let to the Sackett Mine Supply Company, of that city, at its bid of $1,574.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

To Fasten Pipe to I-Beams.

On a recent job in a basement it was desired to run the conduit along the bottom of the I-beams supporting the floor above. To obviate the necessity of drilling and tapping these beams for the ordinary pipe clamps, I made

Strap for Holding Pipe to I-Beam.

a number of clamps from strap iron one inch wide and one-sixteenth inch thick. One end of the clamp was bent over to fit the I-beam and the other end left straight until it had been placed in position around the beam and conduit. It was then hammered down by hammering at the point where it turned the edge of the beam. This drew it up very tight so that it held the pipe securely in place. Such clamps can also be used for two or three pipes that are run close together.

E. W. Dullea.

Fishing Wires.

When pulling wire with loom on it through holes that are bored nearly the size of the loom, the end of the loom often catches against the edge of the hole. We find that a small sewing thimble with a hole punched in the end large enough to receive the wire will save a lot of time and worry. Slip the thimble over the end of the wire before the fish-wire is attached and slide the thimble down until it covers the end of the loom. The thimble will guide the loom through the hole when the wire is pulled.

I. A. Slingerland.

Slotting Commutators.

I have recently tried a new method for slotting commutators and find it preferable to any that have been given heretofore in your columns. Take a tool of

Slotting Tool.

the shape shown in the accompanying illustration and with the same thickness as the width of the slot. Mount it horizontally in the carriage of the lathe and run it along in the slot by using the screw that controls the carriage. A number of cuts can be taken if necessary to secure the desired depth. Then the armature is turned by hand until the next slot comes in line with the tool and the carriage is run along as before.

William T. Estlick.

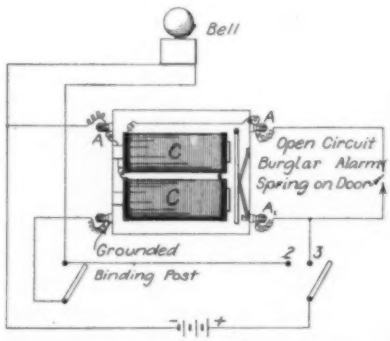
Reaming Battered Conduit Couplings.

When conduit is received from the factory one coupling is screwed on each length of it, the free end of the coupling generally being more or less battered through shipping and handling, so that it is often impossible to start the coupling on a length of conduit. I found that after reaming out the end of the coupling with an ordinary tapered reamer, the coupling will readily screw on another length of conduit.

A. J. Smith.

Burglar-Alarm System.

The burglar-alarm system shown in the accompanying diagram is valuable because it can be tested out and is not stopped by cutting the wires after it has once been set in operation.



Connections for Burglar Alarm.

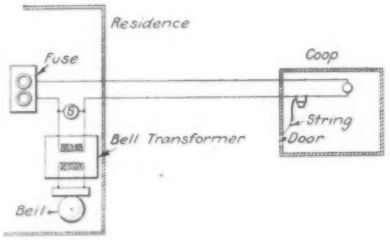
The main feature of this scheme is the metal constant-ringing box shown in the center of the diagram. This contains a magnet CC whose windings terminate in the insulated binding posts AA. Binding post A_1 is insulated except when the armature of the magnet is pulled down, which causes a contact to be made between it and the metal case. The fourth binding post is always grounded upon the metal case.

The switches are shown in the diagram. To test the bell circuit the switch is closed on contact point 2. To make a silent test of the alarm, contact is made to point 3 of the switch. To put the system in operation the switches are closed on points 1 and 3. If, now, the alarm circuit is closed by means of the contact on the door or elsewhere, current flows from the battery through point 3 of the switch, through this alarm contact, through the electromagnet of the ringing box and back to the battery. This causes binding post A_1 to become grounded on the metal case and the circuit is thus closed through switch 3 and the grounded binding posts to switch 1, and then through the bell to the battery.

William Weller.

Burglar Alarm for Chicken House.

A burglar alarm to protect a chicken house can be arranged by utilizing the electric light circuit running from the residence to the outhouse. The accompanying illustration shows the method of connection.



Burglar Alarm for Chicken Coop.

The switch in the residence is normally closed, which short-circuits the bell-ringing transformer when light is needed in the chicken house. To set the alarm at night this switch is opened, which throws the bell transformer in series with the lamp in the outhouse. The latter is mounted in a pull socket with the chain attached to the inside of the door by a light string. Opening the door will close the socket switch and the string will then break; the bell is thus started to ring and the voltage upon the lamp is not enough to cause it to light up.

L. J. Christensen.

Coloring Lamp Bulbs.

Having occasion to make the light from a tungsten lamp, used on a photometer as a substandard, match the amber color of the gas flame, I colored the bulb with a solution of Japan amber lacquer and amyl acetate. If made thin it will give a pleasing amber color that will stand the weather and it wears better than any solution I have ever used.

H. E. Weightman.

Public Service Commissions

Conducted by William J. Norton

ILLINOIS.

The Illinois Northern Utilities Company, of the city of Dixon, was authorized to purchase of the Northern Barb-Wire Company, of Rock Falls, for the consideration of $1,400, its franchise and property necessary for the supplying of electric current for power purposes.

The National Telephone & Electric Company, of Clinton, asked for authority to equalize rates. The petition show its regular schedule of rates for the different classes of service and further states that 80 subscribers of the Clinton exchange own their instruments and by reason of that fact have been granted a special rate. The Commission holds that this is unjust discrimination and gives a number of citations showing that "other state commissions have repeatedly held that no reduction from the regular rate should be granted on account of the ownership of the telephone by the subscriber." The company is authorized to require everyone to pay the regular rates for the standard of service received.

The Christian County Telephone Company, of Taylorville, entered a petition asking for authority to require the telephone users who enjoy concessions or reductions in rates, to pay the regular rates in effect for that class of service. The petition includes a list showing free and reduced rates to cities, county officials, churches and telephone operators. The Commission authorized the changes in rates asked for by the company which will destroy discrimination and require everyone to pay the regular rate for the standard of service received.

The Queen City and Shelby County Mutual Telephone Company was granted authority to increase rates. The decision states that the rates applied for seem to be satisfactory to the stockholders and other patrons of the company and the rates are ordered put in effect for service within the city of Shelbyville and for switching service to county lines.

The Citizens Telephone Company, of Pekin, was granted a certificate of convenience and necessity to build and operate a telephone exchange in South Pekin. A telephone exchange has never been established in this village. The petitioner has two toll lines running through this field and the Central Union has the same number. There was no opposition to the application.

The Christian County Telephone Company was granted a certificate of convenience and necessity to install a telephone exchange in New Kincaid. The town is now without telephone service and the petitioner is furnishing service in the vicinity.

A Certificate of Convenience and Necessity was granted George C. Hallauer to construct a transmission line from Marshall to the city of Martinsville for the purpose of furnishing electric service in Martinsville which is not at present supplied with current for electric lighting purposes.

The Local Telephone Company, of Clifton, was authorized to purchase at $6,000 the property and franchise of the Donovan Telephone Company, of Donovan.

INDIANA.

The General Service Company, of Lafayette, was permitted to put in effect a new schedule of electric light and power rates, and complaints to the Commission entered by the city were withdrawn. The new schedule provides a reduction in rates for large users of electric light and power. During the past year a change in the application of the old rates had resulted in higher charges than those previously exacted under this schedule. The agreement between the company and the complainants also provides for a refund of such excess charges exacted during the year.

The Terre Haute Traction & Light Company was authorized to issue $106,000 of bonds, the proceeds to be used for new construction.

KANSAS.

An amendment to the present public utilities act, which will materially enlarge the authority of the Commission, will be presented to the next Legislature. Following the passage of the act, a clause was found in the measure, which prevented the Commission from exercising authority over utilities which supply but one community and municipal utilities. The Commission discovered this fact when it started to provide regulations for central stations. As a result of the joker in the bill creating the Commission, that body at present has control over less than 20 of over 500 electric light companies, which escape jurisdiction by proving they supply current only within the bounds of their own communities.

MARYLAND.

Municipal Utilities. The Legislature has passed an amendment giving the Commission authority over all public service corporations owned and operated by municipalities with the exception of the city of Baltimore, and by counties. It is reported to have been one of the most popular measures of all the Commission's amendments. Heretofore the Commission has had much trouble with several muncipally owned utilities and has been powerless to provide the necessary regulation.

MASSACHUSETTS.

The Public Service Commission, in its investigation of the New Haven Railroad, comments on the circulation of false statements as follows: "To publish or to authorize the expenditure of funds of a public service corporation for publishing statements known to be false and misleading, concerning official findings as to public service corporations should be made a criminal misdemeanor. Analogous legislation as to false advertising has already been enacted (compare Acts 1911, chapter 492, and Acts 1912, chapter 489.) Investors in mining properties and purchasers of ordinary goods are not entitled to a higher degree of protection against false advertising than are investors in the securities of public service corporations subject to the supervision of regulating commissions."

NEW JERSEY.

John J. Treacy, of Jersey City, has been nominated by the Governor for the position on the Board of Public Utility Commissioners made vacant by the resignation of Winthrop More Daniels.

OHIO.

Telephone Valuations. Telephone companies have asked for an extension of time in which to make appraisals of their property to comply with the Commission's recent order. The request for more time states that the Interstate Commerce Commission has just begun an appraisal of all property,

both real and personal, of all telephone companies and that as experts of the companies are requested to help, it requires the services of all the men who can be spared for this work. Some arrangement may be made to work in connection with the federal employees so that a delay will not be necessary. The suggestion is also made that the appraisal of the Interstate Commerce Commission should be accepted by the state Commission as it will be complete in every detail and will cover everything required by the Utilities Commission.

PENNSYLVANIA.

Protection from Competition. The Commission has defined its position in regard to competition between public utility companies in two decisions, one dismissing the application of the Schuylkill Light, Heat & Power Company for approval of an ordinance granting the right to furnish service in the borough of Ashland involving competition with the Eastern Pennsylvania Light, Heat & Power Company, and the other dismissing the application of the Harmony Electric Company for similar action on an ordinance of the borough of Ellwood City served by the Pennsylvania Power Company. The Commission held that the entrance of a competing company into the territory served by a public service company is of doubtful utility. In the Ashland case the Commission says: "Long experience has shown that while the temporary effect of competition between public utilities occupying the same territory is to secure lower rates, the final result is likely to be the absorption of one by the other and then an increase of rates to pay the expense of the warfare." In the Ellwood City case the Commission says: "Vested rights and interests must be duly conserved and protected. The Commission has no warrant to invite or permit limited competition anywhere unless the area and population served, the need of the community or the prospects of the muncipality, as based on its growth and development, reasonably show that the public welfare demands it. This principle of protection must be extended to the public utility to the end that the individual citizens, who have invested in its plant equipment in good faith, may be duly protected in their interests."

WISCONSIN.

Monroe Electric Company. The Commission has rendered a decision in the case of J. C. Ford, et al. vs. Monroe Electric Company. The complaint alleged unreasonable and discriminatory rates. The decision contains a discussion of depreciation, salaries of executive officers and the various forms of power schedules. The present lighting rates were found to be higher and the power rates lower than the cost of the service and a revision was made in the rates for both classes of service. The rates for street lighting were not changed although these rates were higher than the cost analysis made by the Commission would warrant. The company had changed the schedule for street lighting, providing all-night service for the same cost to the city as for the moonlight, dusk to 12:30 a. m., service previously given under its contract with the city.

Competition of Telephone Companies. In order to insure the discontinuance of competition between the two companies in the same field, the Wisconsin Telephone Company and the Ashland Home Telephone Company made joint application to the Commission for a transfer of property under the Stock and Bond Law. The Ashland Home Telephone Company desired to transfer all of its property outside of the city of Ashland together with the property of the Bayfield County Telephone Company and the North Wisconsin Toll Line Company as well as its bonds of a par value of $17,500.62 and stock of an equal amount, for the property of the Wisconsin Telephone Company within the corporate limits of Ashland. The Commission authorized the transfer of property on the above basis by providing for the issuance of bonds applied for, but stipulated that the stock of the Ashland Home Telephone Company must be transferred to the Wisconsin Telephone Company without cost to the former company. This leaves to the Wisconsin Telephone Company all of the territory outside the city limits of Ashland and to the Ashland Home Telephone Company all of the territory within the corporate limits of Ashland.

Public Utilities Make Fine Showing at Efficiency Exposition and Conference.

The First National Efficiency Exposition and Conference was held at the Grand Central Palace, New York, from April 4 to April 11. Among the big institutions participating the exhibits of the New York Edison Company and the New York Telephone Company attracted particular attention.

The New York Edison Company showed how electricity was being utilized in the home and in industrial applications of every description. The safety features and the advantages both from a utilitarian and esthetic viewpoint, were elaborated upon.

Exhibit of New York Telephone Company.

The scheme of the Telephone Company's exhibit was to show how greater efficiency may be secured by utilizing telephones in everyday business. The various elements that go to make up the telephone system were shown in detail and electrical devices, charts and phonographs were employed to demonstrate the part the telephone plays in gaining greater efficiency. Models of six of the busiest buildings in New York were shown with flashing lights indicating the number of incoming and outgoing calls. The Telephone Company also displayed two films in the motion-picture theater dealing with

the work, training and environment of the telephone operator, and giving an insight also into the way in which a great telephone system is organized and its work is carried out. A special feature was an illustrated lecture by W. F. Schmidt, who told in a most interesting fashion the story of working out the telephone conversation.

Newcomb Carlton Elected President of Western Union Telegraph Company.

At the annual meeting of the stockholders of the Western Union Telegraph Company, held on April 8, the by-laws of the company were amended so as to provide for the affairs of the company to be arranged by a board of 21 instead of 30 directors, as at present. Seven of the directors, including the president, shall constitute an executive committee. Consequently the number of directors was reduced from 30 to 21, and the representatives of the American Telephone & Telegraph Company retired from the board. The following were re-elected directors: Oliver Ames, William Vincent Astor, Henry A. Bishop, Newcomb Carlton, Robert C. Clowry, Henry P. Davison, Chauncey M. Depew, Edwin Gould, George J. Gould, Thomas H. Hubbard, Robert S. Lovett, Edwin G. Merrill, Jacob H. Schiff, Joseph J. Slocum, James Stillman. The following new directors were elected: William H. Baker, Henry W. DeForest, William Fahnestock, Percy A. Rockefeller, Mortimer L. Schiff and William H. Truesdale.

The annual report of the Western Union Telegraph Company shows total earnings for the year ended December 31, 1913, of $45,783,512.58; operating expenses, including rent of leased lines, reconstruction, repairs, taxes, etc., $42,327,121.27, leaving a balance of $3,456,391.21. Adding income from rents and investments, including rentals from real estate, amounting to $1,115,755.18, and deducting interest on bonds to the amount of $1,337,229.12 there is a balance transferred to surplus account of $3,234,917.37.

There have been added to the land line plant 623 miles of poles and 18,458 miles of wire, consisting of an increase of 25,797 miles of copper wire and a decrease of 7,339 miles of iron wire. The company now has 25,060 independent and joint offices.

Referring to the prospects of the company, either under any possible purchase by or competition of the government or as a going concern operating independently of the American Telephone & Telegraph Company, the report states:

"The relations between the American Telephone & Telegraph Company and your company have always remained the same as between two entirely independent companies. The organizations of the two companies were entirely distinct and independent and, with the exception of the president and a minority of the directors, had no officers in common. All contracts and operating arrangements were such as two independent companies could enter into under the interpretations of the existing laws, and the commercial interests of each company were carefully guarded, so that the so-called divorce of the two companies is being accomplished with very little confusion.

"As to the government purchase or operation of the telegraphs: The property of the company cannot be taken without just compensation, that is, a full and proper equivalent for the property taken must be returned to the owners. In such a case, the shareholders should receive, as a minimum, far in excess of the present market value of the shares."

At a meeting of the Board of Directors of the Western Union Telegraph Company held on April 15, Newcomb Carlton was elected president in place of Theodore N Vail, and the following preamble and resolutions were adopted as a tribute to Mr. Vail:

Whereas, Mr. Theodore N. Vail has retired from the directorate of the company and also from the presidency, and

Whereas, The connection of Mr. Vail with the Board of Directors of this company and his administration as president have been attended with signal benefits to the company, which the Board of Directors wishes to recognize, and its appreciation of which it desires to spread upon the records of the company, now, therefore, it is

Resolved, That the Board of Directors hereby expresses its very great regret that Mr. Vail has severed his connection with this company and retired from the administration of its affairs as president.

Further Resolved, That the Board of Directors of this company hereby expresses its high appreciation of the great benefits the company has received from Mr. Vail's administration and as a member of the directorate.

Among the benefits so received the board desires especially to enumerate the acquisition of the cable lines, and the inauguration of the deferred cable service which has resulted in great benefits to the public and to the company, the inauguration upon the land lines of the system of night and day letters, the extension of service by improved connections and facilities to many additional localities, the inauguration of the pension plan for the benefit of employes, the reconstruction and improvement of the physical condition of the lines, and the rearrangement of the company's organization resulting in improved discipline and service and increased facilities to the public.

Further Resolved, That the Board of Directors extends to Mr. Vail the thanks of the stockholders whom it represents, and the individual appreciation of its members, for the services which he has rendered this company, with the wish that he may long be spared to render to the companies with which he remains connected the benefits of his unusual administrative abilities, his ripe experience and sound judgment.

Additional officers were elected as follows: G. W. E. Atkins and Belvidere Brooks, vice-presidents; William H. Baker, secretary; A. R. Brewer, treasurer; E. Y. Gallaher, comptroller.

THE TELEPHONE HAS MADE POSSIBLE THESE SKYSCRAPERS

AND PERMITTED THE RAPID EXPANSION OF BIG BUSINESS.

SOME INTERESTING TELEPHONE FACTS REGARDING THESE BUILDINGS

BUILDING	Average Number of Lines in Service	Average Number of Stations in Service	Average Number of Feet of Wire in Cable	Average Number of Feet of Wire not contained in Cable	Average Number of Incoming Calls During Busy Hours	Average Number of Outgoing Calls During Busy Hours	Approximate Number of Calls Per Year—Incoming & Outgoing
Bankers Trust	275	874	3,859,696	174,800	790	798	2,786,400
Singer	322	938	1,713,464	187,600	740	741	2,665,800
Woolworth	481	1102	3,084,086	275,800	1100	1106	3,970,800
Whitehall	606	1466	3,025,334	232,200	1600	1638	5,742,400
Metropolitan Life	385	1151	Private Owned	Private Owned	770	770	2,772,000
Hudson Terminal	1383	2933	4,508,642	647,400	3000	3180	11,124,000

Statistical Exhibit of New York Telephone Company, at National Efficiency Exposition, New York, April 4-11.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Annual Spring Meeting in Pittsburgh, April 9 and 10.

The 293d meeting of the American Institute of Electrical Engineers was held in Pittsburgh, Pa., April 9 and 10, under the joint auspices of the Committee on the Use of Electricity in Mines and the Pittsburgh Section, A. I. E. E. Meetings were held morning and afternoon of Thursday and Friday and Saturday was devoted to inspection trips to the local steel mills; the Bureau of Mines, and plants of local manufacturers. An Institute dinner was held on Thursday at which Charles F. Scott made a brief address on the advancement being made in the electrical industry. He is conducting an inspection trip of Yale students through the industrial centers of the East and commented briefly on his observations on this trip.

The meeting was called to order shortly after 10 a. m., Thursday, by A. M. Dudley, chairman of the Pittsburgh Section, who cordially welcomed the delegates to what he termed the center of the greatest mining district in the country. In referring to the main topic of the convention he said that the greatest need in the mining industry, insofar as electrification is concerned, is for greater standardization of practice and appliances.

Paul M. Lincoln was then introduced as the personal representative of President Mailloux. He briefly referred to the objects of the Institute and to its rapid growth. It is now the largest of the four national technical societies, although 10 years ago it was the smallest in point of membership. This growth numerically, he said, is indicative of the growth of the electrical industry. In concluding Mr. Lincoln spoke of the growing tendency of mine operators to electrify their mines and the obligation that this imposes on the electrical engineer to design safe and efficient apparatus.

Wilfred Sykes, chairman of the Committee on Use of Electricity in Mines was then called to the chair. Before taking up the papers he referred to the importance of regulation of electrical installations and called attention to the committee report on this subject. This report contains reprints of the German laws relating to electrical installations in mines, the English laws, the rules proposed by the Bureau of Standards, the rules proposed by the American Mining Congress, and the Pennsylvania mining law, electrical section. Mr. Sykes said that most of these rules embody the ideas and prejudices of the individuals identified with their compilation and were therefore not as broad as could be desired. He said that it is the hope of the American Institute to have an exhaustive discussion of these rules, from which a comprehensive report can be prepared which will be brought before a joint committee of the organizations interested. Such a report would be of value to state governments in framing suitable legislation and would also serve as specifications for mine operators in ordering and installing electrical equipment.

The paper entitled "Mine Duty Controllers," by H. P. Reed, of Milwaukee, was then presented by W. C. Kennedy.

Mine Duty Controllers.

The paper is devoted to discussion of the advisable types of control to be used for various mining equipment, particularly in bituminous coal mines. Complexity and theoretical details have been eliminated as far as practicable with the idea of impressing on the reader the need for certain definite features, without going into the theoretical detail of these features. Electric controllers for equipment outside of the mine proper as a rule have to meet different operating conditions than those controllers which are installed underground. The operating conditions are taken up in detail and proper control equipment is suggested to meet these conditions. The object of the paper is to bring out clearly to the mine operatives the fact that suitable control equipment is just as important as the installation of a suitable motor, and moreover that no motor, however well adapted to the service, will stand up properly if it is not operated with a controller designed and built specifically to meet the existing installation and operating conditions.

F. L. Stone, of Schenectady, opened the discussion, calling attention to the necessity of giving consideration to control eqiupment for 2,200-volt motors. This voltage is coming more into use and must be controlled in a safe and efficient manner. Oil-immersed switches are used to some extent but where the operation is frequent and the service severe, as in the case of the mine hoist, trouble is encountered due to the carbonization of the oil, which causes arcing. He said that another case of damage to oil-immersed switches is that a body of gas will form on top of the oil and finally a hot bubble will arise, and if the proper proportions of air are present a violent explosion will occur. He thought that the only alternative is a properly designed air-break contactor. Figures were presented indicating the satisfactory operation of these devices under severe conditions. In one case a contactor has opened a circuit 388,000 times without any renewals or repairs. Mr. Stone thought that the encased moisture-proof starter mentioned in the paper as being safe for use in locations where arcing is dangerous would be more desirable if built on the principle of the safety lamp. He held that it is almost impossible to make a perfectly air-tight joint through which electric wires can be brought. He asked for an expression from the Bureau of Mines on this point. Mr. Stone also called attention to the growing tendency to control motors by means of liquid controllers and in conclusion stated that flywheel motor-generator sets are very inefficient and should only be used in mine work where excessive peaks are penalized or where power-station capacity is limited.

S. G. Vigo, of Chicago, Ill., stated that difficulties had been encountered in controlling large direct-current hoist motors in the manner described in the paper. He inquired as to the size of motors best suited for the control mentioned.

Graham Bright, of Pittsburgh, spoke of the importance of periodic inspection of mine control equipment. He thought that self-starting motors are suitable for small fans and pumps used inside the mine. He took exception to the statement that the controller for mine locomotives with the series-parallel feature in the reverse lever is an advantage over the railway type of series-parallel controller, in that gathering can be accomplished with the motors in series, as the motorman in most cases uses the parallel position for all service. He also took exception to the statement that vertical hoists can best be electrified by the use of the variable-voltage system using a flywheel motor-generator set. He advocated alternating-current motors with either magnetic or liquid control, as being more economical and satisfactory.

H. H. Clark, of the Bureau of Mines, presented test data on oil-immersed switches in answer to the inquiry of Mr. Stone. A switch of this type was subjected to 75,000 breaks, without explosion, although the device was surrounded by natural gas and air. He stated that no data are available on performance beyond 75,000 breaks. He added that oil switches could be made explosion proof if the various parts are proportioned to the duty to be performed. In the tests mentioned the switch cases were left open so that the gas could become associated with the contacts except as prevented by the oil

H. D. James, of Pittsburgh, emphasized the importance of using care in selecting the proper control equipment.

C. J. E. Waxbom, of Columbus, O., thought that controllers for coal-cutting machines were much abused by the workmen. For this reason oil switches are not entirely satisfactory. Friction control allowing the motor to be started under no load was recommended.

W. M. Hoen, of Pittsburgh, brought out that for fans, wound secondary motors are best if the starting current

is limited. If any great amount of speed reduction is required and resistance control is used the loss in resistance is objectional. Direct current is usually supplied to a mine because of locomotives and if fan service is supplied from the same source a separate feeder should be run from the bus bar. Mr. Hoen said that if direct current is used for pumping self-starting motors should be used up to 20-horsepower sizes. For hoist service he thought that motors of average size could best be controlled by contactors and a liquid rheostat for larger motors. The use of alternating current in the mine simplifies the control problems.

A. S. Biescker, of Scranton, thought that in some cases it was not desirable to use automatic starters for motors driving centrifugal pumps as frequently the water drains out of the runners when the pump stops and if started in this condition would result in damage.

Mr. Kennedy replied that local conditions have to be taken into consideration when applying controllers to mine pump motors.

The first business at the afternoon session was the presentation of a paper entitled, "Self-Contained Portable Electric Lamps," by H. O. Swoboda, of Pittsburgh.

Self-Contained Portable Electric Mine Lamps.

The considerable number of mine explosions caused by defects of the Davy safety lamps has encouraged the development of electric lamps. Satisfactory results, however, have been obtained only since the invention of the tungsten lamp, permitting the use of smaller storage batteries. The general requirements for electric lamps are: absolute safety, uninterrupted production of light for at least one shift, and a foolproof design. Prizes offered by the British Government in 1912 for the best electric lamp resulted in 197 different constructions being submitted. The first prize was awarded to a German lamp, which since that time has been used with great success all over Europe and which is also being introduced in this country. The construction of this lamp, consisting of several types for different requirements, and the methods of handling it in actual service, are fully described. Some figures covering repairs and renewals are given. In concluding, the author mentions the only objection that can be raised against electric portable mine lamps, that they cannot be used as detectors of mine gases, as Davy lamps can, and says that for this purpose devices distinctly separate from the lamp will have to be adopted.

The discussion was opened by H. H. Clark, of the Bureau of Mines, who said that the prime requisite of a portable electric lamp for mine duty was safety. Also, a lamp to be successful must be able to operate day after day with a reasonable amount of repairs and replacements. He thought that in this connection it is of particular importance that the battery be very sturdy. Lamp bulb replacements form one of the largest items of expense and American manufacturers should give consideration to bulbs for this service. Mr. Clark asked if the candlepower values mentioned in the paper referred to average candlepower over the stream of light and whether or not reflectors were used.

H. H. Smith, of Orange, N. J., commented on the maintenance costs mentioned in the paper. He said that the items of 20 per cent for battery repairs and renewals and 35 per cent for attendance could be materially reduced by the use of alkaline batteries. He took exception to the statement that the life of 2,000 shifts claimed for the alkaline battery did not affect cost because the other equipment does not last this length of time. He said that in the cap lamps the battery was separate from the other equipment and long life for the battery was very desirable.

R. P. Burrows stated the opinion that a primary battery was available which compared favorably with the lead cell. He mentioned a lead cell having an electrolyte of sawdust saturated with sulphuric acid as an excellent substitute for the liquid batteries. He added that the life of the lamps used depends upon the efficiency at which they are burned.

Mr. Swoboda closed the discussion; answering Mr. Clark he said the candlepower figures were average values and were measured without reflectors. Regarding alkaline batteries he thought the use of two cells not desirable for this work. The first cost is also higher and this offsets the advantages.

The Committee on the Use of Electricity in Mines prepared in printed form the rules governing electrical installations in mines of Germany, England, the Bureau of Standards, the American Mining Congress and of the State of Pennsylvania. The various rules differ in many respects but all follow the same general outline of topics covered.

The first point brought up for discussion related to definitions, the discussion being opened by H. H. Clark of the Bureau of Mines. Mr. Clark pointed out that a code of rules should tend to assist rather than restrict. The departments should be well balanced as to length of treatment with the rules governing inspection and maintenance receiving the greatest consideration. He thought that the section devoted to definitions could comprise 10 per cent of the total; the section treating character of the equipment to be used 20 per cent; installation rules 30 per cent; operation 15 per cent; inspection and maintenance 20 per cent; and miscellaneous matter 5 per cent.

C. W. Beers, of Wilkes-Barre, thought that one of the important sections of the rules should be that devoted to safety suggestions for employees. In this connection he saw no advantage from the hazard standpoint of 250-volt service over 550 volt. All apparatus should have attachments for ground connection.

C. M. Means, of Pittsburgh, said that wherever a definite set of rules governing mine electrical installations were in use the tendency was to standardize the equipment used in the territory coming under the jurisdiction of such rules. He thought this a step in the right direction and advocated a set of National rules along the general lines of the National Electrical Code.

Taking up the subject of mine plans, Chairman Sykes called upon W. A. Thomas, of Pittsburgh, to open the discussion. He thought that it was expensive and difficult to represent electrical circuits by different colors as it is necessary to re-draw these lines on blue prints if the latter are desired. He favored symbols to designated electrical apparatus and different voltages.

H. H. Clark, of the Bureau of Mines, stated that a code of symbols such as mentioned had been developed by the Bureau.

Discussing the next question of "Permissible Voltages." J. S. O'Donovan brought out the point that in steel-mill practice all voltages above 250 are considered dangerous and are treated accordingly. He thought it advisable to paint all open wires carrying over 250 volts some definite color so that they could be readily distinguished.

W. A. Thomas thought that the permissable voltage in coal mines should not be fixed in any code of rules but should be governed by local conditions. He also thought it a question as to the extent exposed wires could be marked without excessive expense.

E. M. Hewlett, of Schenectady, thought that the degree of protection provided should depend to some extent upon the class of men supposed to work under the particular conditions. Less precaution need be taken in a substation where only skilled men are employed than in a mine shaft where the maximum number of safeguards must be provided.

J. P. Clayton, of Matoon, Ill., referred to the Illinois laws which specify that trolley wires cannot carry more than 250 volts. He stated that the advent of central-station service for coal mines has made the use of high voltages desirable because of the excessive losses in transmitting low voltage current. The practice in Illinois is to carry the high voltage lines over the surface and pass the leads through drill holes at the points of application. He described briefly a three-phase mine haulage system which is operating satisfactorily.

W. A. Thomas pointed out that every

precaution should be taken to see that high-voltage cables are outside of the range of pick points. Cables should preferably be armored. He thought the prejudice of mine operators against alternating current was unfounded although he favored direct-current haulage systems.

A. S. Biesecker, of Scranton, stated that 2,200-volt service was used in the anthracite district for pumping. Cables enter bore holes over pumps. He thought that jute-covered cables should be used because of the danger of the acid in the mine water destroying the insulation. He added that the main objection to alternating-current service in old mines was the cost of duplicating the direct-current network which already exists.

O. S. Newton, of Columbus, O., thought that much educational work must be done before alternating-current service would find favor with mine operators. Remarks along the same lines were made by H. R. Summerhays, A. M. Dudley, E. R. Spencer, V. G. Brehm, W. W. Miller and G. C. Hyde.

The paper by G. M. Eaton, of the Westinghouse Electric & Manufacturing Company, entitled, "The Development of the Electric Mine Locomotive," was presented at the opening of the session on Friday morning.

The Development of the Electric Mine Locomotive.

The paper traces, lagely by means of pictures, the course that has been followed in developing the mine locomotive to its present condition. The paper is limited to locomotives for operation in coal mines. The two main factors which have directed the development are, first, the demand for increased entry capacity, and second, the exploitation of thin seams. The early machines were high, and of irregular outline, whereas later machines are compact and strong, yet accessible, and easily inspected and overhauled. Various types of framing are illustrated. Locomotives with two and three axles in rigid wheel base, and also tandem locomotives are shown and described. Reference is made to various methods of connecting the motors by which the adhesive weight is used to full advantage. Gathering locomotives, with vertical and horizontal reels, both axle-driven and with independent electric drive, are illustrated, and some of the problems of gathering work are briefly discussed. There is also brief reference to various types of motors with different methods of lubrication, as well as some reference to sleeve vs. frictionless bearings. The paper closes with a few tendency curves, and attention is called to the lines of future development, which these curves apparently indicate.

C. W. Beers, of Wilkes-Barre, Pa., in opening the discussion, commented on some of the general principles that the Lehigh Coal Company observes in drawing specifications for locomotives. Bearing troubles are the most annoying and special attention is given this subject. Mr. Beers thought that the manufacturers should co-operate with the operators in designing machines if the best results are to be obtained. He thought it advisable for the Institute to collect data on operating performances of locomotives used in various parts of the country.

W. W. Miller, of Schenectady, called attention to what is considered the first electric mine locomotive, which was built in 1887 and still is used to a limited extent.

C. J. E. Waxbom, of Columbus, emphasized the importance of "safety first" in mine haulage. He advocated rolled-plate frames in preference to cast frames as being safer, and also ball bearings rather than sleeve-type bearings. Patching or repairing of locomotive frames should be avoided on the larger machines, as he considered this dangerous.

Grahm Bright, of Pittsburgh, discussed the relative merits of box-type and open steel-bar type frames for mine locomotives. He favored the latter because of the greater air space for motor ventilation. He also favored ball-bearings as compared with the sleeve type, although he thought the friction of the latter would not materially affect power consumption.

F. L. Stone, I. C. Ilsley, N. W. Storer, and W. A. Thomas entered into a discussion of the relative merits of ball and sleeve-type bearings and the effect of box and open-type frames on motor ventilation.

G. Shapter called attention to the merits of the storage-battery gathering locomotive. He stated that savings of 30 to 35 per cent over mule haulage could be effected by their use. The total operating cost of such equipment is four cents per ton-mile of which 60 per cent represents labor.

The two papers dealing with mine substations were then presented in abstract. These were "The Construction and Operation of Mining Substations," by H. Booker, of the Pittsburgh-Buffalo Company, and "Motor-Generator Sets Versus Synchronous Converters as Applied to Mine Work," by W. M. Hoen, of the Westinghouse Electric & Manufacturing Company.

Construction and Operation of Substations.

The use of electricity in mines has been making rapid progress throughout the United States. Steam and compressed air are being superseded largely by central-station power. Power from a central station requires a substation to supply direct current to operate locomotives, cutting machines, etc., and to transform high-voltage alternating-current to direct-current at 250 or 500 volts. Substations, when possible, should be located on the surface, because if located underground there is danger from fire, and dampness weakens insulation and causes corrosion of metallic parts. Construction of an underground substation is more costly than on the surface, as there is danger of the roof giving way. The roof should be arched, or built of heavy concrete and the whole station made fireproof. When substations are located underground it is necessary to carry a high-tension cable through bore-holes. When located on the surface a low-tension cable can be used. Many accidents occur because of incompetent men. Good salaries should be paid and competent men obtained. Danger warning should be posted and men taught to consider wires as being "live," thereby lessening accidents.

Motor-Generator Sets versus Synchronous Converters.

The number of mines which use electrical power supplied by transmission lines carrying high-voltage alternating current is constantly increasing. Low-voltage direct current is usually required for underground work in all coal mines. These conditions require the installation of motor-generators or synchronous converters. The extent and location of the mine workings will determine the voltage of the direct-current supply. Improper application of the transforming apparatus may result in great variation of voltage in the direct-current network, with its attendant disadvantages. The operating characteristics of the induction and synchronous motor-generator sets and synchronous converters are considered with regard to starting conditions, direct-current regulation and the effect on the alternating-current transmission lines, alternating-current voltage regulation, and power-factor correction. Mine conditions and the nature of the power supply will determine the type of transforming apparatus which will give the most efficient and satisfactory operating conditions. Each of the several types of apparatus has a field where the best results will be obtained.

These two papers were discussed briefly by W. A. Thomas, Paul Lincoln, O. S. Newton, N. Stahl and W. M. Hoen. Mr. Thomas pointed out that from the standpoint of economy the synchronous converter was to be preferred, although motor-generator sets were more desirable in the many cases where large corrective effects are required on the line, and over-compounding is necessary. Because of the purchase of power by many mines it is frequently desirable to use the synchronous motor-generator set because of the power-factor being under the control of the operator.

Mr. Lincoln said that the synchronous converter has many advantages and its only limitation for mine service lies in the difficulty in over-compounding.

Mr. Stahl favored the use of synchronous converters wherever possible. He said that power-factor correction could be obtained by adjusting the field of the motor. Where power is received at high voltages from transmission lines, the capacity effect may make it more desirable to have a lagging at light loads and leading at maximum loads. Under these conditions the syn-

chronous converter will give the most desirable performance.

The final session, on Friday afternoon, was devoted entirely to the continuation of the discussion on mine regulations for electrical installations.

Construction of Apparatus.—H. H. Clark opened the discussion on this paragraph criticising the rules presented as being too general. This has a tendency to promote unnecessary controversy between inspectors and operators. Too specific rules are equally objectionable.

Portable Apparatus.—Graham Bright discussed this subject, commenting on the change which has come about in the purchase and use of mine machinery. Apparatus is now purchased on an engineering basis, and the tendency is towards simplicity and efficiency.

Rules for Installation.—L. C. Ilsley said that no temporary installations should be tolerated in a mine. Capable workmen should be employed and every installation made in a workmanlike manner. This will reduce the number of breakdowns and accidents. No rules governing installations can be made that will be applicable to all conditions.

W. M. Hoen advocated the use of armored cable for all main feeders and also separate circuits for the haulage system in all cases.

H. H. Clark thought that one of the most important requirements in connection with the installation of apparatus was to provide sufficient space and light around each piece of machinery. All contributary causes to accidents should be guarded against.

Lighting.—Graham Bright opened the discussion on this subject urging the location of lamps at all switches and cross-overs. All apparatus should be lighted to facilitate inspection.

W. A. Thomas suggested the wiring of two lamps in multiple at all important points so that light would still be available in case of a failure of one lamp.

W. M. Hoen said there was need for much more lighting in coal mines. These compare very unfavorably with metal mines where the lighting is much more extensive.

Shot Firing.—H. H. Clark thought there was a need for a simple and inexpensive device for ascertaining the capacity of shot-firing batteries. He explained a series of tests conducted by the Bureau to determine whether accidental explosions could be caused by induced current in the firing circuit. A coil of No. 18 copper wire, 1,400 feet long was wound around a length of steel rail and a standard No. 6 detonator connected across the terminals of the coil. A current of 220 amperes was passed through the rail, momentarily, several times and although the voltage across the terminals of the coil was found to reach a maximum of 8.5 volts, no explosion took place.

Grounding.—P. M. Lincoln opened the discussion on this subject advocating the grounding of every device possible. This affords not only protection to the workmen but to the apparatus as well.

W. A. Thomas recommended connecting the return circuit of the haulage system to the air and water pipes along the main passageways. He said this would compensate for defective or inefficient rail bonds. He thought the manner of making connections a field for scientific investigation by the Bureau of Mines.

L. C. Ilsley advocated wrapping the connecting wire around the pipe several turns and then soldering to the pipe. D. C. Hyde favored the use of a copper strap secured around the pipe to which the wire should be soldered. Graham Bright thought the type of ground connection for mine service should be standardized.

Program of Washington Meeting.

The 294th meeting of the American Institute of Electrical Engineers will be held in Washington, D. C., on Friday and Saturday, April 24 and 25. This meeting will be under the auspices of the Electrophysics Committee and the Washington and Baltimore Sections, and will be a joint meeting with the American Physical Society.

The sessions will be held at the Bureau of Standards, where the new electrical laboratory will be open for inspection. A special feature of this meeting will be an exhibit of apparatus which has been arranged by the local committee of the American Physical Society. The exhibit will be participated in by more than 30 manufacturers, importers, industrial research laboratories, university laboratories and scientific bureaus of the Federal Government.

The American Physical Society will conduct the sessions on Friday and Saturday mornings, beginning at 9:30 o'clock. About 50 papers in all will be presented in abstract. On Friday afternoon at 3:30 o'clock there will be a lecture by Sir Ernest Rutherford on "X-Ray and Gamma-Ray Spectra." On Friday evening there will be a session conducted by the American Institute of Electrical Engineers, at which the following papers will be presented: "A Theory of Corona," by Bergen Davis; "Some Investigations of Lightning Protection for Buildings," by T. M. De Blois; "A Milliampere Current Transformer," by Edward Bennett; "Some Simple Examples of Transmission-Line Surges," by W. S. Franklin; "Solenoids," by C. R. Underhill.

This session will be followed by a smoker.

The Illumination of Railway Signals.

At a joint meeting held in Chicago by the Chicago Section, Illuminating Engineering Society, and the Railway Signal Association, on the evening of April 10, three papers dealing with illumination of signals and allied matters were presented and discussed.

The first of these papers was presented by Thomas S. Stevens, of the Santa Fe Railway, Topeka, Kans., the title of this paper being "Illumination of Railway Signals." In this paper Mr. Stevens pointed out that three types of lamps have been used for this purpose, namely, kerosene lamps, electric lamps and acetylene lamps. The first of these are still most extensively used and in their early stages were rather crude affairs. He traced the development of oil lamps, pointing out particularly how the so-called long-time burners permit a decided saving in maintenance and labor, since such lamps are given attention only twice weekly. Wherever practicable, electric lamps have been introduced. At first, lamps as large as 16 candlepower were employed, but it was found that a considerable reduction in the size of the lamp was permissible, since the important thing is to have the light source at the focus of the lens. One-candlepower electric lamps have given good results for signal purposes; in large signal installations they are supplied from dynamos but in small plants current is taken from storage batteries which are periodically charged from gasoline-engine-driven sets. The energy consumption of one-candlepower lamps is so small that a very small battery provides sufficient energy for lighting a fair-sized signal plant for two or three days. Recently extensive installations of alternating-current signals have been made in which two-candlepower lamps are lighted continuously day and night. The energy consumption of these lamps is so small that it is believed to be cheaper to operate the lamps continuously than to develop and use a complicated control equipment for extinguishing them during daylight hours. Mr. Stevens also called attention to an acetylene lamp developed by a Swedish firm; this is of the flashing type in which control is obtained by a magnetic valve. In concluding his paper, Mr. Stevens called attention to the rapid development in lenses, which have now been so perfected that they illuminate signals properly to make the different colors readily distinguishable in daylight at a distance of about 2,000 feet. There is being introduced the all-electric signal, in which semaphore arms with their complicated operating mechanism are entirely dispensed with. In this case two

25-watt lamps are used behind an eight-inch lens.

J. S. Hobson, Union Switch & Signal Company, opened the discussion by stating that 20-watt lamps have been used very successfully in the Pittsburgh district with 10-inch lenses. These are visible day or night in the smoky atmosphere prevailing there at distances of 4,000 to 5,000 feet. Use is made of a concentrated form of filament located at the focus of the lens.

G. L. Walters, Adams & Westlake Company, spoke of the importance of studying the character of the oil used with oil lamps; pure paraffin oils obtained from Pennsylvania give very little trouble, but as the source of the oil is obtained now very largely from other wells, notably Kansas, Texas and the western part of the country, impurities are more met with, which cause annoyance; these have necessitated a change in the design of the burner.

W. H. Elliott, New York Central Lines, said that the long-time oil burner requires but 40 per cent of the maintenance and labor costs which are chargeable to the one-day burner. He emphasized the need of having the source of light in the focus of the lens. On account of slight imperfections in the lenses the focus is not at a geometric point. This is really an advantage because flickering or slight displacement of the light from the true focus does not cause so much flickering of the signal. He said that it is much more important to have the filament of electric lamps placed at the focal zone than it is to have a very powerful lamp and showed how a 16-candlepower lamp of the old type did not give as good illumination of the signals as a much smaller lamp with a concentrated filament. Low-voltage lamps using thick filaments are being introduced and are giving very good results. They give longer life, are more rugged and are best run from the low-voltage side of a transformer.

A written communication was presented from W. N. Manuel, Grand Rapids & Indiana Railroad, in which he also spoke of the use of low-voltage lamps becoming more general. A. G. Shaver, Rock Island System, spoke of the necessity for having oil very carefully handled so as not to become contaminated. M. G. Lloyd called attention to the new helical-filament lamp as making an ideal source for signal work, since the filament can be placed at the exact focus of the lens. In reply to his question regarding the relative use of different light sources for signal purposes, Mr. Stevens said that oil lamps are still most generally used; electric lamps are used to the extent of about 4 or 5 per cent; acetylene lamps are being used on a few railroads only.

Nelson M. Black, Milwaukee, Wis., then presented a paper entitled "The Physiology of the Eye and Its Relation to Railway Signaling." In this paper Dr. Black pointed out that the observation of signals requires the recognition of position or color, or both position and color of a signal. With the aid of lantern slides, he then expounded the physiology of the eye and showed how form vision differs from color vision. Perception of the form of an object depends upon the size of the image received on the retina, the amount of light reflected from it and the contrast with the background. Observations have shown that a person with good normal vision can distinguish the form of an object if the angle subtended by it at the retina equals five minutes, or if the parts of the object, such as a letter, are wide enough to subtend a one-minute angle. Dr. Black explained the means of rectifying nearsightedness, farsightedness and astigmatism by means of appropriate lenses. Railway officials in conjunction with ophthalmic surgeons have adopted minimum standards of visual acuity, particularly for enginemen and firemen. This standard requires the ability to read letters which subtend a five-minute angle at a distance of 20 feet. Taking up color vision, Dr. Black explained the theory of color and showed that the average normal eye can differentiate six distinct colors in the visible solar spectrum. The ability to distinguish color depends upon the hue, the saturation and the intensity of the color. He showed a variety of glasses used as roundels in signal work and pointed out the characteristics of their various colors. He then discussed at some length subnormal color perception, commonly mistermed color-blindness. He showed the importance of railway men being free from this defect and explained at length the various tests made for determining even slight traces of color-blindness. Marine and railway service require the absolute elimination of all persons with subnormal color vision, since the trend of signal practice seems to be toward the use of colored signals illuminated by transmitted light by day as well as by night. He described the difficulties that an engineman meets with in correctly observing signals. He pointed out the effect of various atmospheric conditions upon the visual range of signals. All of these require that the engineman must have normal vision with both eyes and that he also must be capable of quick perception.

The discussion of Dr. Black's paper was opened by Dr. Harry Gradle, Chicago, who added regarding the physiology of the eye that the lens of the eye serves also to protect the retina from ultra-violet rays. He explained the process of accommodation and dwelt on the importance of having binocular or double-eye vision in order to be able to get a sense of depth or distance.

A written communication was presented from Dr. D. W. Weaver, Greensburg, Ind. He explained the work of what is known as the visual purple, which is the active chemical medium of the eye. Poor visual acuity is often due to fatigue, alcohol, nicotine or other poisons. He called attention to the difference in color values of different light sources as affecting the color of the transmitted light from signals.

M. G. Lloyd discussed the effect of atmospheric absorption on signals of different colors. Although experiments on a small scale show red to be most absorbed by fog, in practice it is discernable at a greater distance than light of shorter wave-length. He suggested that since persons completely color blind are sensitive only to intensity regardless of color, they might be of great value as photometrists in color photometry. Dr. Black stated that few if any persons are completely color blind, and little was known regarding their relative sensations from different intensities.

C. C. Anthony, Pennsylvania Railroad, spoke of the electrification of that system near Philadelphia. It was originally proposed to use overhead catenary construction in which the trolley wires would be supported by steel bridges. Since these bridges would obstruct the view of signals on the signal bridges it was proposed to abandon the use of semaphore signals and to install in place thereof and under the bridges electrically lighted signals which would be in service both day and night. Subsequently it was decided to use span-wire construction for supporting the catenary, but the advantage of using light signals instead of the semaphore was recognized as being so great that in all probability electric signals will be retained. Others who discussed this paper were Thomas S. Stevens, G. E. Marsh, W. H. Elliott and J. B. Jackson.

H. P. Gage, of the Corning Glass Works, Corning, N. Y., then presented the last paper of the evening, which was entitled "Signal Lenses." He described and illustrated the variety of lenses used in signal work, pointing out the difference between the so-called optical, inverted, wide-angle and spread-light lenses. He gave the results of many tests to show the various angular distances at which light could be observed through these various types of lenses. Dr. Gage explained methods that should be followed in the selection of types of lenses for different use.

The National Electric Light Association Convention, Philadelphia, June 1 to 5.

The general convention committee of the National Electric Light Association has issued its first general circular with regard to the thirty-seventh convention which will be held at Philadelphia, Pa., June 1 to 5. This circular gives considerable information relating to convention details, and is quoted from liberally herewith. It is 27 years since the Association visited Philadelphia. The first convention held there was in February, 1887, and was attended by about 500 persons. A conservative estimate of the attendance expected at the thirty-seventh convention places the attendance at 5,000. The thirty-seventh convention will also celebrate the thirtieth anniversary of the first International Electrical Congress held in America and the first American International Electrical Exhibition, both held in Philadelphia in 1884.

The headquarters of the Association will be at the Bellevue-Stratford Hotel. This is claimed to be one of the largest and most perfectly equipped hotels in the country. All of the regular sessions will be held in three commodious meeting rooms on the ball room floor, one flight up, where more than 2,000 members can participate at one time and can within a minute go from one section to another. The Exhibition Committee, on behalf of the Class D members, has made arrangements for the occupancy of the entire roof garden of the hotel and the exhibit that has been planned will undoubtedly be one of rare beauty and interest. The setting will be of unusual artistic attractiveness. The roof garden where the exhibition will be held has a wide view over the whole city, and has also a separate restaurant of its own. Thus the entire convention will be housed in one building, while the facilities are such as to minimize any crowding or difficulty of circulation. The illustrations reproduced herewith will give a good idea first, of the remarkable panorama of Philadelphia which may be viewed from the roof garden, and again, of the unusual attractiveness of the other facilities which will be at the disposal of those in attendance at the convention. The offices of the secretary, the Hotel, Transportation and Local Registration and Information Committees, the Main Registration Bureau, and the bureaus for the distribution and deposit of convention reports and papers, will all be on the ballroom floor, within immediate access of every meeting hall. Telephonic bulletins will keep each room and the offices advised as to the progress of business in the various sections.

Bellevue-Stratford Hotel, Convention Headquarters.

Work of the Convention.

The work of the convention will begin on Tuesday morning, June 2, and will close on Friday morning, June 5. A very full program has already been arranged in the general, executive, technical, commercial, accounting and hydroelectric sections and sessions, but it is proposed to limit mere reading of papers and reports as much as possible, and to develop discussion. There will be several parallel sessions during Tuesday, Wednesday and Thursday, culminating in a most important general and executive meeting on Friday morning. The complete program will be published in the April *Bulletin* of the Association.

Entertainment.

The convention will open on Monday night, June 1, with the annual reception to the president in the grand ballroom. With this and the public policy meeting of Wednesday night, special features of interest will be associated. On Wednesday afternoon the annual baseball game will be played for a trophy cup, and there is already keen interest among the competing company section teams. At the time of the convention, a rejuvenation will be held by the Jovian Order, whose membership is very large in the ranks of the National Electric Light Association. Other general entertainment is being arranged for during the week by the Special Entertainment Committee of the Convention Committee, for ladies, of which announcement will be made in due course. Opportunities will also be provided for visiting the numerous historic spots in which Philadelphia is so rich.

Registration.

For some years past it has been the practice of the Association to issue, in advance, a set of separate registration cards for attendance, papers, hotel accommodation, transportation, etc. A change of method is being attempted this year, in combining these cards into a triplicate form, which the member fills up and returns, once for all, to the Association office, stating his plans, preferences, arrangements and other details. It is hoped that this plan will facilitate the convenience of all and lessen the immense amount of incidental work. The set of cards will be issued with a supplemental circular, in the near future. The registration of the large membership in the Philadelphia district will be in the hands of a local Registration Committee.

Roof-Garden Restaurant, Bellevue-Stratford.

South Side of Roof Garden, Bellevue-Stratford.

Hotel Accommodations.

Very complete data have been prepared by the Hotel Committee, of which A. H. Manwaring is chairman. This committee will be pleased to answer all inquiries with respect to hotel accommodations. A Reception Committee will assist at the railway depots and hotels.

Ball Room of the Bellevue-Stratford.

Transportation Arrangements.

The Transportation Committee has practically completed arrangements for the movement of members of the Association from all sections of the country to Philadelphia. This committee is under the direction of George W. Elliott, of the McGraw Publishing Company, New York, chairman.

There are still a few of the passenger associations that have not yet taken definite action on reduced fares, but it is quite probable that there will be very little change in what has been done in previous years. Special trains are being arranged for from Chicago, one over the Pennsylvania Railroad, leaving, probably, in the evening, and making the daylight run between Pittsburgh and Philadelphia, arriving at the convention city in the early afternoon. The committee is also trying to arrange for a special from Chicago over the Lake Shore Railroad, leaving in the morning and taking on, at Toledo, members from Detroit and other adjacent points, and also at Cleveland the large delegation that usually goes from that large electrical center, reaching Buffalo late in the evening and taking up Buffalo and Canadian travel. Another special is being arranged for the Southeastern Section, and much is expected for the success of this train, as all the members in that section are bending every effort to make it a representative movement. Definite decision has not yet been arrived at regarding the Pacific Coast members. It may be found necessary to run a special from San Francisco. The Kansas City and St. Louis contingents will move to Chicago and there feed the two specials from that point, as before described. This will also apply to St. Paul, Minneapolis and Northwestern points. On account of the short run between New York and Philadelphia, and the excellent train service between these two cities, it has been decided not to attempt to arrange for special trains. This will also apply to Boston, the New England delegates preferring to go to New York, and from there to Philadelphia. The Transportation Committee and the railroads between New York and Philadelphia will be in close touch all the time, to insure sufficient train

equipment on the days when the members are going and returning from the convention.

The Philadelphia Committee.

President McCall has appointed a General Convention Committee under the chairmanship of W. C. L. Eglin, second vice-president of the Philadelphia Electric Company, to lay out and supervise the general arrangements for the convention. The committee will, of course, be increased from time to time, but as it now stands comprises the following officers of the Association and other well known members, many of whom are identified with the Philadelphia Electric Company and other leading local interests: W. C. L. Eglin, J. I. Ayer, P. H. Bartlett, John A. Britton, D. T. Campbell, E. C. Deal, A. J. DeCamp, J. J. Gibson, G. R. Green, J. D. Israel, A. B. Huey, W. H. Johnson, E. W. Lloyd, Herbert Lloyd, H. C. Lucas, A. H. Manwaring, J. T. Maxwell, H. K. Mohr, E. D. Mullen, R. B. Owens, Holton H. Scott, J. B. Seaman, Paul Spencer, H. Townsend and W. F. Wells.

Panorama From Roof Garden, Bellevue-Stratford Hotel, Philadelphia, Pa., Where Exhibits of the National Electric Light Association Convention Will be Installed, June 1-5.

Francis Jehl Honored by Emperor Francis Joseph.

Emperor Francis Joseph of Austria-Hungary has conferred the "Ritter Kreuz des Franz Joseph Order" ("The Knights Cross of the Francis Joseph Order) upon Francis Jehl, electrical engineer of the General Electric Company of Budapest, Hungary.

Mr. Jehl has been connected with the work of the Budapest Company for the past 17 years and has been prominently identified with electric lighting and power developments in Europe and America ever since the early development of the Edison incandescent electric lamp at Menlo Park, N. J., he having been one of Mr. Edison's earliest and ablest assistants at his laboratory and taking part in the epoch-making experiments leading to the development and perfection of the Edison incandescent electric lamp, the Edison system of electrical distribution, the Edison electric railway, etc. Mr. Jehl was brought into intimate touch with the work of Mr. Edison and his ablest associates and partners, Charles F. Batchelor and Francis R. Upton and with those other early assistants and co-workers of Mr. Edison at his Menlo Park Laboratory, John Kreusi, Julius L. Horning, Dr. Haid, Charles L. Clarke, William J. Hammer, E. L. Nichols, E. G. Acheson, E. H. Johnson, W. S. Andrews, John Ott, L. K. Boehm, W. Holzer, Martin Force, Albelt Herrick, John W. Lawson, Samuel Insull, S. D. Mott and others.

In 1881 Mr. Jehl equipped and superintended the testing department of the Edison Machine Works in Goerck Street, New York, and from this school of practical experience, graduated many a young man into the pioneer electrical engineering work of this country and Europe.

Early in 1882 Mr. Edison sent Mr. Jehl to England to install the perfected Edison electrolytic meter in the Holborn Viaduct central station of 3,000 lights, which had been constructed for the English Edison Company by Edward H. Johnson, general manager, and William J. Hammer, chief engineer. This station started up January 12, 1882. After installing the meter department for the English company, Mr. Jehl went to France to undertake similar work for the French Edison Company and about this time he prepared the first work in the world ever written upon the electric meter.

As engineer of the French Edison Company, he assisted Mr. Edison's partner, Charles Batchelor (who had gone abroad in 1881 to establish the French Edison Company) and Etienne de Fodor (now at the head of the Budapest Company) and Nikola Tesla, E. G. Acheson and others in getting the electrical works, lamp factory, etc., of the French Edison Company started. He later traveled extensively in Europe, introducing the Edison electric lighting system, and installed the famous plant for lighting the Brünn Theater at Berlin, Austria, which theater was lighted throughout by electricity and did not contain a single gas jet.

Francis Jehl.

Mr. Jehl made a similar installation with the Edison system in Bucharest, Roumania, and in 1883 he had charge of the Edison Exhibit at the Vienna Electrical Exhibition, during which he had the honor of being presented at the Austrian Court. At one time Mr. Jehl was associated with the Hardtmuth Carbon Company of Austria and visited the United States in the company's interest. While in Vienna in 1899 he wrote the first complete work upon carbon manufacture, which was published by the London *Electrician*, and he took out a number of patents upon various inventions, such as carbon economizers, continuous furnace for carbon manufacture, electric meter and a Faraday disk type of dynamo, known as the Jehl-Ruppe disk dynamo.

While at Menlo Park, he invented a very simple type of mercury pump which was extensively used for exhausting incandescent lamps, and during his stay in Austria he established a small lamp factory in order to protect the Edison lamp patents in that country.

In addition to the publications already referred to, Mr. Jehl has been a frequent contributor to the electrotechnical press both here and abroad.

Total exports of copper in March amounted to 45,973 tons, as compared with 41,702 tons last year.

New Electrical and Mechanical Appliances

Schwarze Electric Horns.

The Schwarze Electric Company, Adrian, Mich., has added to its extensive line of electric bells, gongs and buzzers a number of electric horns for use on automobiles and motorcycles. These are of the direct-current type and are made in several forms having various sizes of diaphragm, style of megaphone, etc. In all of them the contact points are of pure platinum so as to render them non-arcing. The diaphragm construction is such that the plunger or striking pin is not fastened to the diaphragm, thus current consumption is reduced to a minimum and the life of the diaphragm prolonged. The best materials and expert workmanship are used in the manufacture of these horns. They produce a great volume of sound whose tone is deep, resonant and penetrating. The standard finish on these horns is of black enamel with nickel trimmings.

One of these electric horns of the megaphone type is shown in Fig. 1 herewith. This has a diaphragm 5.5 inches in diameter and is arranged to be connected ordinarily to five dry cells or a six-volt storage battery, such as is standard for automobile ignition and lighting service. The outfit can be wound for a higher voltage, if desired. Each of these horns has a double twisted, insulated cord nine feet long and special push button.

An electric horn for motorcycle use is shown in Fig. 2. This has a special push button on the back cap of the horn. The construction of the horn has been so carefully worked out that its entire weight is only one pound. A steel battery case containing two dry cells is furnished with the outfit, the batteries being connected to the horn by a twisted rubber-insulated cord three feet long. Although this outfit is designed for use on two ordinary dry cells, it can also be wound to operate on six volts, if desired. Although this horn is very light in construction it gives a loud sound.

Fig. 1.—Electric Horn for Automobile.

Fig. 2.—Electric Horn with Battery Case for Motorcycle.

Automatic Fire Alarm for Hotels and Clubs.

Louis H. Egan, general manager of the Kansas City Electric Light Company, has suggested, following the disastrous Missouri Athletic Club fire at St. Louis, that electricity be called into play to prevent repetitions of such holocausts. Mr. Egan's idea is to have a signal board installed on each floor of hotels, clubs and similar buildings. Loud gongs would be connected to the system and, on the principle utilized in automatic sprinkler systems, unusual heat would set off a thermostatic device so as to close a circuit and ring the bells in each room, thus effectively warning the occupants of the impending danger. Mr. Egan says there is no doubt as to the practicability of the plan.

Electricity Used to Prevent Boiler Corrosion.

An electrical device for preventing boiler corrosion has recently been installed at the United States Navy Yard at Brooklyn. An electrode is fixed inside the boiler and direct current at from six to ten volts is supplied to this electrode and the boiler shell. In this way a film of hydrogen is formed which prevents the adhesion of scale and preserves the plates from corrosion.

Control Panel with Emergency Feature for Motion-Picture Projecting Lamps.

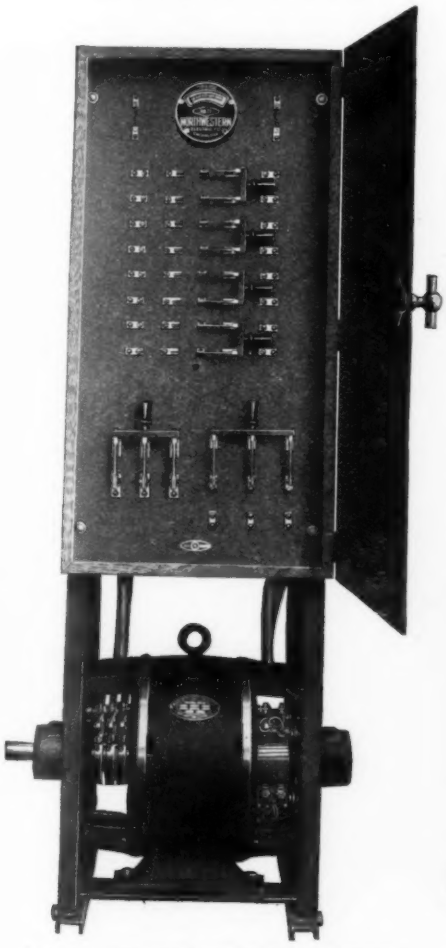
It is generally known that, in order to get a clear and satisfactory presentation of motion pictures in a theater that aims to maintain its patronage, it is necessary to use direct-current projecting arc lamps which with their intense white light produce exceptional distinctness of the pictures. For getting direct current for this purpose from an alternating-current supply several rectifying equipments have been used, of which the rotary converter is generally conceded to give the highest efficiency and best general results.

In our issue of August 2, 1913, there was described the Martin rotary converter, which is being manufactured by the Northwestern Electric Company, 613 West Adams Street, Chicago. This machine, it will be recalled, is of rugged construction and has among its good operating characteristics, high efficiency, self starting, good regulation and requires a minimum amount of attention to keep it in good running condition. This rotary has been found peculiarly suitable for supplying direct current for moving-picture lamps and a special panel has therefore been devised for use therewith to facilitate the control.

A view of this panel is shown herewith. It is mounted in a steel cabinet on an angle-iron framework directly over the rotary so that the entire outfit takes up a floor space of but 30 inches square; its total height is six feet. Directly behind the panel is mounted a step-down transformer with a number of secondary taps. A small steadying resistance is provided for

each arc lamp circuit; these resistances are also mounted back of the panel. All of the connections between the alternating-current line terminals, transformer, rotary converter, lamp resistances and switches are already made, so that it is necessary to connect merely the line and lamp circuits.

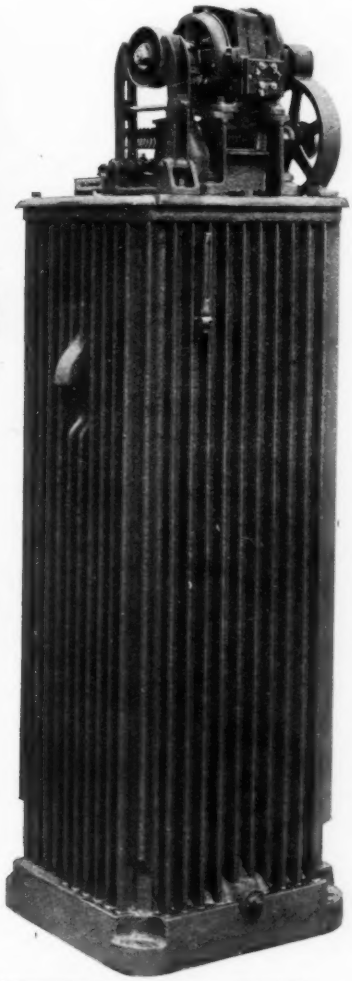
The right-hand three-pole fused switch on the front of the panel is the line switch; the three-pole switch to the left of it is the rotary converter switch. The lamp switches are placed above and are double-throw switches supplying to the lamps direct current from the rotary when thrown to the right and alternating current from the transformer when thrown to the left. A voltmeter is placed at the top and, if desired, an ammeter is mounted alongside of it.



Control Panel and Converter for Motion-Picture Projecting Lamps.

On closing the line switch the transformer is energized and on closing the converter switch the rotary starts. Should its polarity be wrong, as shown by the voltmeter, the converter switch is opened for a few moments until the machine slows down, then the switch is again closed to bring the polarity right; direct current is then immediately available for any one or more of the lamp circuits.

Although the probability of the rotary being out of commission is very remote, even this contingency is provided for by the emergency throw-over feature alluded to above. Thus it is possible to supply alternating current to the lamps direct from another set of taps on the transformer and no interruption in the performance is caused thereby. The transformer taps and resistances are so calculated as to eliminate the need for all adjustments. The entire outfit is self-contained and can be installed in a small room adjoining the operating room, so that there is introduced in the latter no fire hazard from fuses or hot resistances. These panels are made suitable for single-phase, two-phase or three-phase supply and for converter sizes ranging from 2.5 to 7.5 or even more kilowatts.



Automatic Feeder-Voltage Regulator.

Electric railway construction in Canada aggregated 106 miles in 1912, and 204 miles in 1913.

Large Order for Automatic Feeder-Voltage Regulators.

What is said to be the largest order ever placed for feeder-voltage regulators has been given to the General Electric Company by the Commonwealth Edison Company, Chicago, Ill. It calls for 100 36-kilovolt-ampere, 60-cycle, 150-ampere, automatically operated induction regulators, designed for 2,400 volts primary and 240 volts secondary. This makes a total of approximately 400 regulators purchased by this company from the General Electric Company, Schenectady, N. Y. These 100 new regulators will maintain constant voltage on alternating-current feeders aggregating 36,000 kilovolt-amperes in capacity. A view of one of the new regulators is shown adjoining.

A New High-Efficiency Ornamental Street-Lighting Unit.

A strong tendency at the present time in street lighting is toward a single-light ornamental standard having a globe of ornate design. The lighting unit to meet these requirements, however, must also be of high efficiency.

New Unit.

Such a unit has recently been developed by the Holophane Works of General Electric Company, Cleveland, O., and is shown mounted on a standard in the accompanying illustration. The outer glassware of the unit consists of two pieces. The upper part is made of Pyro, a dense opal glass, and the lower part of a light-density opal glass or C. R. I. (crystal roughed inside) glass. As a result, the upper portion acts as a reflector, returning a considerable proportion of the upwardly directed light onto the street surface, where it becomes useful in performing its illuminating function. The lower part diffuses the intense light of the powerful lamp used. The unit is designed for use with the new high-efficiency nitrogen-filled Mazda tungsten lamps of either the multiple or series type. With a 750-watt multiple nitrogen lamp the maximum candlepower is 950 at an angle of about 65 degrees.

The appearance of this unit is ornamental and very pleasing. This, together with its high efficiency of light distribution, makes it ideal for business district and boulevard lighting.

Large Electric Organ for Panama-Pacific Exposition.

One of the largest organs thus far erected in this country will be built for

the Panama-Pacific International Exposition by the Austin Organ Company, of Hartford, Conn. The instrument will have 118 speaking stops and will be electrically controlled throughout. It will be installed in a festival hall on the exposition grounds in San Francisco and later will be erected for permanent service in a large auditorium in that city.

Glass-Letter Sign for Department Store.

A new type of individual glass-letter sign has been placed on the market by the Federal Sign System (Electric), Chicago. The accompanying illustration shows one of these signs installed at the Wabash Avenue entrance of Charles A. Stevens & Brothers' store. This sign is made of the new six-inch miniature lamp letters and is one of

Glass-Letter Sign for Chicago Department Store.

the first signs of this type installed for outdoor use. Each letter is made in exactly the same manner as the 3.5-inch letter signs which have come into extensive use for indoor and window service. The new six-inch letters are made of slightly larger glass tubes and the filaments are arranged exactly like those in the well known smaller letters, but of course have greater candlepower and brilliancy.

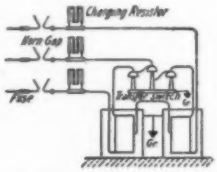
This sign is double-faced and is finished in natural bronze. Plate glass is used to cover the letters on each face, thus making the sign weatherproof.

In Tokio, the capital of Japan, steel-taped lead-sheathed cables have been laid under the streets to connect urban substations with receiving stations located in the suburbs at the ends of high-tension transmission lines. These underground cables carry 12,000 volts.

A New Electrolytic Lightning Arrester.

For the protection of cable systems, motors and generators connected directly on a line without transformers, or transformers with weak insulation on their end turns, the Westinghouse Electric & Manufacturing Company has recently introduced a lightning arrester, known as the Type AK, with a charge-and-discharge resistor in series with the standard electrolytic element. This resistor serves to limit the charging current to a low value and to damp out any surges that might result in charging, particularly if the system contains enough capaci. to produce resonance. The arrester is made for use on circuits up to 14,500 volts.

The electrolytic element consists of treated aluminum trays stacked one on another, separated and insulated from each other by porcelain spacers on the periphery of the trays, the number of trays in a stack depending upon the normal voltage of the line on which the arrester is to be used. The stacks of trays are suitably supported in frames, and each tray is filled with electrolyte. The stacks are then ar-



Connections of Lightning Arrester.

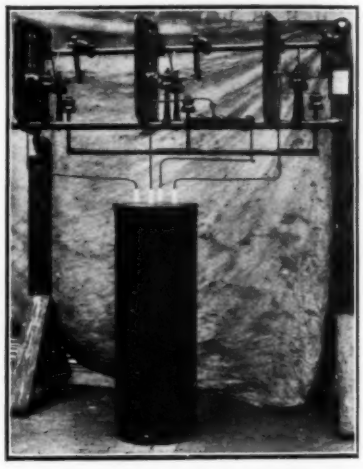
ranged in welded steel tanks and immersed in oil.

In actual operation a film of the electrolyte forms on the surface of each tray. This film has a high critical resistance at normal voltages, but the resistance becomes low at abnormal voltages. It therefore forms a free path for abnormal voltages or static charges, but upon cessation of the abnormal stress the film instantly regains its high resistance.

The arrangement of the trays and the electrolyte is such that the electrolytic element acts as an electrostatic condenser. The flow of current, due to the capacity of this condenser, varies inversely as the frequency of the circuit. Thus, at normal commercial frequencies the flow of current is small, but at the high frequencies of lightning discharges and static disturbances, considerable current flows through the element, increasing the action of discharging the static charges and preventing flow of current at normal frequency.

When an electrolytic arrester is being charged, surging currents are set up in the system. Under most conditions these are harmless, due to insulation of the apparatus connected in the same circuit. However, as above noted, there are cases in which these surges are dangerous and in order to remedy this danger a graphite resistor is used to damp out the surges and limit the charging current to a low and safe value.

This resistor is connected in series between the horn gap and the arrester in each phase. It is shunted, however, by a series of non-arcing metal spark gaps which are auxiliary to the main horn gap. In the operation of charging, the horn gap is short-circuited, as usual, and at the normal voltage of the circuit the charging current takes the resistance path rather than the shunt auxiliary gap path. On the occasion of a discharge due to lightning or static disturbances the auxiliary spark gap path is easily broken down, and the discharge passes through same rather than through the resistor, thereby assuring precisely the same free-



New Electrolytic Lightning Arrester.

dom of discharge as in the case of an arrester which does not use the charging resistor. Upon the circuit being restored to normal voltage and frequency after the discharge, the auxiliary spark gaps cannot maintain the circuit and it is shunted to the resistance path. This action is very materially helped by the use of multiple gaps between non-arcing metal. The resistor limits the amount of dynamic current flowing, and thus helps in the final action of opening the circuit by the rise and final break of the arc on the horn gap.

On each occasion of charging ungrounded-neutral arresters to rebuild these films, after once bridging the horn gaps, the leads connecting the two middle legs to the ground and to the center fuse, respectively, should be interchanged and the gaps again bridged, thus serving to charge all the

legs of the arrester. To facilitate this charge, a transfer switch is provided as shown in the illustration. A hand-wheel is geared to this transfer switch in such a way that the switch can be reversed without the operator in any way coming in contact with live parts, the frame of the arrester being grounded.

New Bristol Electric Tachometer of the Alternating-Current Type.

The field of usefulness for recording tachometers includes use in connection with all engines, machinery or revolving shafts wherever information is desired about the rate of speed at which shafting or any other devices are revolving. Some of the most important applications are in connection with engines, turbines, generators, paper machines, blast-furnace blowing engines, motors and pumps. Recording tachometers are usually required for continuous service under ordinary shop or mill conditions and for this reason must be made rugged and durable to be thoroughly successful.

A new Bristol's electric tachometer of the alternating-current type which is particularly well suited to rough operating conditions in mills, power plants or shops is being put on the market by the Bristol Company, Waterbury, Conn. Although this is an electric tachometer, no sliding contacts or brushes are used in it and no delicate millivoltmeter movements are required.

Two of the most important features of this electric tachometer which makes it particularly strong and durable are, the induction magneto and the voltmeter movement. The magneto, as shown in the accompanying illustration, is of the induction type without any sliding contacts or brushes. The indicating and recording instruments are voltmeters. The indicating instrument is equipped with a Weston pivot-jewel-bearing voltmeter movement. The recording instrument is equipped with an improved Bristol voltmeter movement so designed that there is plenty of power available for actuating the recording arm even though the recording pen is in continuous contact with the surface of the chart. In this recorder the movement is mounted on frictionless knife-edge bearings. This movement is equipped with a new patented supporting device for the moving elements designed to eliminate temperature error. This recorder can be furnished for use with either 12, 8 or 6-inch charts.

The illustration shows a combination indicating and recording unit, which provides an indicating instrument for the operator at his post of duty and a recording instrument for the superintendent or foreman in his office. Suitable lengths of leads can be furnished for locating either instrument at almost any desired point. Connections can be furnished for more than two instruments, if desired. A simple form of this tachometer can also be furnished either with the indicator alone or the recorder alone.

Alternating-Current Recording and Indicating Tachometer.

Frink Banquet to H. W. Johns-Manville Company Branch Managers.

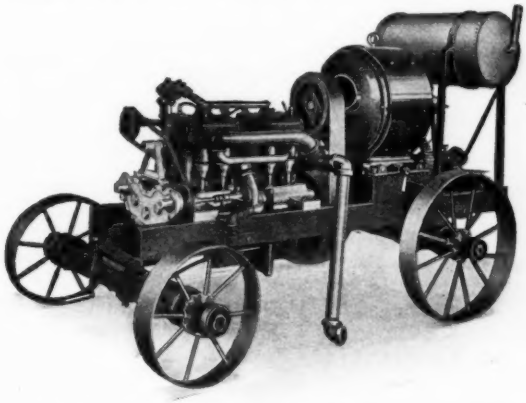
A very fitting close of the annual meeting of the managers of the electrical departments of the 47 branches of the H. W. Johns-Manville Company located in the principal cities throughout the United States and Canada, was the banquet recently given to those in attendance at the meeting by the management of I. P. Frink, for whom the H. W. Johns-Manville Company acts as sole selling agent. The details of the banquet which was given in the Gold Room of the Imperial Hotel, New York City, were planned and directed by W. H. Spencer.

G. F. Spencer, manager of I. P. Frink, gracefully performed the duties of toastmaster. J. W. Perry, W. H. Spencer, S. G. Meek, and many of the visiting branch electrical department managers added much to the pleasures of the evening and their responses had many touches of humorous and serious oratory. There was a splendid response by Bassett Jones, illuminating engineer, who was one of the guests.

Generating Equipment for Lighting Amusement Devices.

The illustration herewith shows a portable generating equipment made up by C. W. Parker, manufacturer of amusement devices of all kinds. The outfit consists of a "Standard" 115-volt, compound-wound, direct-current generator made by the Robbins & Myers Company, Springfield, O., mounted with a gasoline engine on a steel-frame truck. The engine is of the automobile type and is connected to the generator by a short belt with idler-pulley attachment.

To meet the requirements of the various devices with which these generating outfits are used, five sizes are made, using Robbins & Myers generators of 2, 3, 5, 7.5 and 10 kilowatt capacity. The switchboard is mounted directly in front of the generator. It is equipped with the switch, fuses and a Ward Leonard wall-type rheostat.



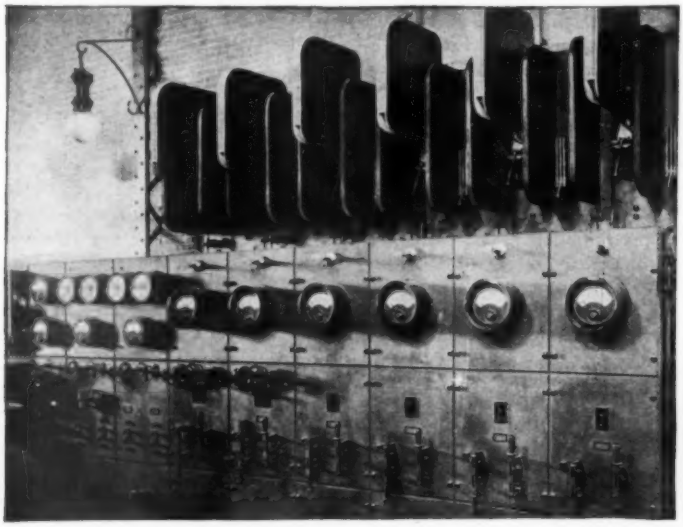
Portable Gasoline-Engine-Driven Generating Equipment for Amusement Devices.

Low-Candlepower High-Efficiency Incandescent Lamps.

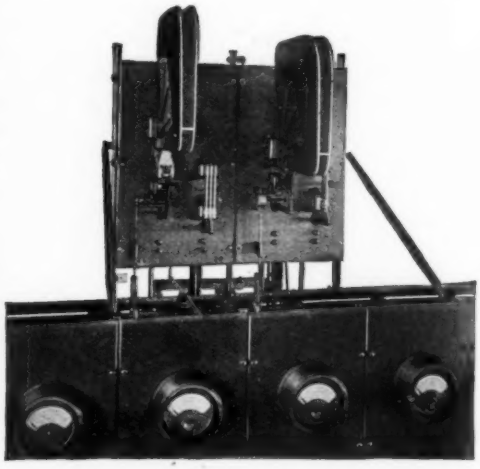
Nitrogen-filled lamps are now being supplied in Germany for automobile lighting in units as low as 45 candlepower for voltages between six and eight volts, and in 90-candlepower units for voltages between six and twelve volts. These lamps are said to consume 24 and 48 watts, respectively, thus having efficiencies of about 0.535 watt per candle. Spiral filaments are used. High-voltage units of low candlepower and high efficiency are being developed.

Switchboards for 2,400-Volt Direct-Current Railways.

The first 2,400-volt direct-current switchboards built in this country have been installed by the Butte, Anaconda & Pacific Railway Company in two substations supplying power to its 2,400-volt electric railway recently placed in operation. As described in the general article on this railway in our issue of March 14, 1914, in each station there are two 1,000-kilowatt motor-generator sets, each motor driving two 500-kilowatt 1,200-volt direct-current generators connected in series to give 2,400 volts, excitation current at a potential of 125 volts being furnished by separate exciters. The alternating-current control is along the usual lines for remote-control switching, but the control of the direct-current ends of the machines has several new and very interesting features.



2,400-Volt, Direct-Current Switchboard in Butte, Mont., Substation.

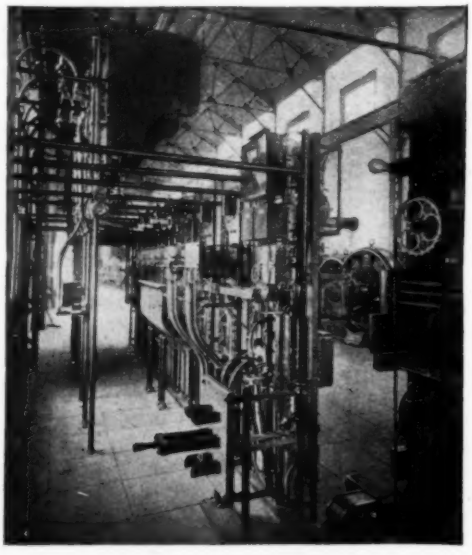


Enlarged View of Circuit-Breaker Panel.

The high-voltage direct-current generators are protected from injury in the case of overloads and short-circuits by a circuit-breaker of special design developed for use in 2,400-volt direct-current railway service. A remarkable feature of this circuit-breaker is the use of an arc chute provided with a magnetic blowout of great intensity, the pole pieces of the blowout coil being so designed as to distribute the magnetic flux uniformly over the whole arc chute, thus insuring that the direct-current arc will be ruptured when the circuit-breaker opens. This device has been subjected to a long series of short-circuit tests made under actual load conditions to insure absolute dependability.

Low-voltage protection is secured by means of a low-voltage release coil, which, forming a part of the breaker and acting in conjunction with a speed-limiting device installed on the corresponding machine, prevents overspeeding by tripping out the breaker as soon as the speed for which it is set is passed.

Both the low-voltage release and a reverse-current relay are connected in the 2,400-volt circuit through high resistance and are insulated from the circuit-breaker so that the speed-limit device on the generator may be kept at ground potential. The low-voltage release must be set before the breaker will remain closed. This setting is accomplished by lifting the plunger by means of a wooden rod connected through a bell-crank mechanism to an operating handle on the front of the switchboard, the handle being pushed toward the switchboard. The breaker may be tripped manually by pulling the operating handle out to the limit of its travel. The circuit-breaker is also provided with a bell-alarm switch, which closes the bell circuit when the breaker opens, the circuit being opened again as soon as the main switch is closed.



Rear View of 2,400-Volt Switchboard.

The lever switches and circuit-breakers are mounted on insulators, thus providing effective insulation. Large clearances have been allowed for all current-carrying parts.

The main buses are located above and to the rear of the circuit-breaker panels—the latter being located back of the panels carrying the instrument and metering equipment—and are protected by an asbestos-lumber covering which inclines upward from the top of the circuit-breaker panels to the wall behind the switchboard, forming an effective barrier between the circuit-breakers and buses. This construction accomplishes a double purpose, both preventing circuit-breaker arcs from reaching the buses and also making it impossible for anything to fall on the buses from above.

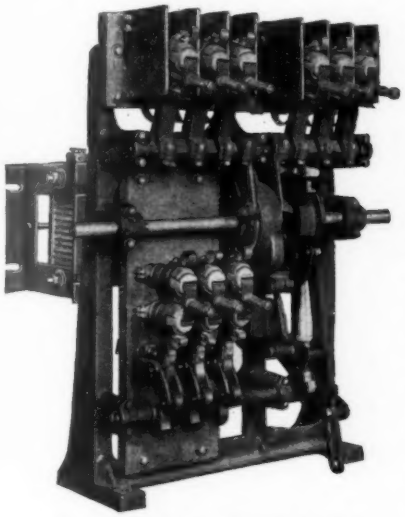
All potential leads and buses are mounted on insulators, and the flexible shunt leads are carried in fiber tubes, also mounted on insulators. Every precaution has been taken to insure the safety of the operator. There are no high-voltage live parts exposed on the front of the panels, and the lever switches and circuit-breakers are mounted on separate panels back of the main switchboard, as stated above, and operated by handles on the front of the main panels, acting through wooden rods and suitable mechanism, thus insuring that the handles shall be perfectly insulated. The

ammeters are incased in insulating covers, while the voltmeter, mounted on a swinging bracket, is connected to the circuit on the grounded side with the separate resistance on the positive side, thus making the potential from meter to ground a minimum.

These 2,400-volt switchboards were built by the General Electric Company, Schenectady, N. Y., and they have proved so satisfactory in operation that orders for others of the same general construction have followed.

Mechanical Elevator Controllers for Alternating-Current Equipments.

The new mechanical type elevator controller made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has been designed for use with polyphase motors. Because of the extensive use of central-station alternating-current service by factories, industrial plants, etc., a simple controller of the alternating-current type has been needed. The controller shown in the accompanying illustration has no electromagnets or sliding contacts; it is arranged to be operated from the car by means of a rope or lever. The operating shaft has an extension at each end so that the controller can be adapted for either right-hand or left-hand operation. This controller has the further advantage of operating satisfactorily on circuits having a very wide voltage variation.



Controller for Alternating-Current Elevators.

The primary circuit is controlled by two sets of switches, each set consisting of three single-pole switches, equipped with arcing shields. Each set of primary switches is operated by a special internal cam, arranged so as to give an absolute "knock out" to the switches when opening, and also an absolute "lock out" for the second set of switches, when the first set is thrown in.

The secondary resistance is cut out by three triple-pole cam-operated switches. Immediately after the primary switches are thrown in a catch is released, allowing a weight to drop, the motion of which is retarded by a suction dashpot. This weight in turn drives a shaft on which the necessary cams are mounted for throwing in the secondary switches. The secondary resistance is cut out simultaneously in all three phases of the rotor circuit, thus insuring a balanced condition at all times. The secondary resistance is reinserted upon the opening of the primary switches and a latching arrangement is also provided so as to prevent accidental operation of the controller.

The electrical butt-type contacts are of the same type throughout, thus simplifying renewal of parts subject to wear.

German Electrical Manufacturer Establishes Museum of Safety and Hygiene.

The Allegemeine Elektricitäts Gesellschaft, of Berlin, the largest German electrical manufacturing company, has established for its employees a museum of safety and hygiene. Several rooms are devoted to literature and objects explaining means of guarding against accidents from machinery, the giving of first aid to the injured, ventilation, physical culture, food and nutrition, with a special display warning against the abuse of alcoholic drinks.

While Germany long has recognized the benefit of museums, this is the first case known there of a factory erecting a museum solely for its own workmen. However, the A. E. G., as the company is familiarly known, has long been actively interested in welfare work among its employees and only recently received a gold medal from the American Museum of Safety "in recognition of its very meritorious achievements in conserving life and limb in its great German establishments."

Electric Floating Crane.

A large floating crane of 150 tons capacity is being used at the Charleston Navy Yard. The entire mechanical equipment is electric-motor driven, the power being obtained from a generator direct connected to a Diesel oil engine and an Edison storage battery. The hoisting equipment consists of two main hoists each of 75 tons capacity, capable of operating simultaneously with a total capacity of 150 tons and an auxiliary trolley and hoist of 15 tons capacity. The total cost of the crane was over $294,000.

Automatic Electric Bench Washer.

A new type of electric washer has been placed on the market by the Automatic Electric Washer Company, Newton, Iowa. This outfit is designed for places where there is an exceptionally heavy washing to be done and where a machine of more than the customary capacity is needed. As shown in the illustration herewith, the machine has the regular Automatic washer tub and equipment and is mounted on an iron-framework bench with extension. In its extended form this bench can accommodate two additional tubs and a clothes basket. A swinging wringer is mounted on a post at the middle of the outfit and the wringer may be turned in any position about this central post. It can therefore be used in connection with any of the tubs; thus while the tub full of clothes is being washed in the electric washer another batch may be run through the rinsing or blueing water. It is also possible for two laundresses to work at the outfit at the same time. An advantage claimed for this type of washing outfit is that all of the washing, rinsing and blueing tubs can be mounted on one bench so that it is not necessary to lift these from place to place.

Automic Electric Bench Washer.

The main bench upon which the machine is mounted is 24 inches wide and 39 inches long. The extension table can be pulled out to increase the width by 20 inches. This extension or slide table is detachable and is readily moved. When the extension is pushed back into place the entire outfit occupies but small floor space and being mounted on castors can be moved about. The bench framework is constructed of gas pipe and angle irons and is exceptionally strong and yet not excessively heavy. The reversible wringer is of the ball-bearing pattern and has extra long coil springs to give a wide range of work of both light and heavy articles that can be wrung without changing the tension. The wringer has a safety release device.

Latest Approved Fittings

CONDUIT, Rigid. — National Enameling & Manufacturing Company, Youngstown, O.

"Enamelduct." Black enameled conduit.

"Armyduct." Galvanized exterior, black enameled interior.

"Alumaduct." Galvanized exterior, red-oxide baked enamel interior.

"Alumaduct Special." Red-oxide baked enamel interior, galvanized and red enamel exterior.

Conduit shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, has label attached to each length.

Approved March 6, 1914.

FLEXIBLE CORD.—Canada Wire & Cable Company, 1160-70 Dundas Street, Toronto, Canada.

Marking: One red and one black thread cabled with the copper strand.

Cords shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 26, 1914.

FIXTURE WIRE.—Standard Underground Cable Company of Canada, Limited, Manufacturer, Hamilton, Ontario, Canada.

Marking: Green thread woven in braid in a clockwise direction.

Fixture wires shown by tests and examinations conducted by Underwriters' Laboratories, to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each coil.

Approved March 11, 1914.

INSULATING MATERIALS.—F. M. Williams, 1288 Prospect Avenue, Brooklyn, N. Y.

Red, white, brown and black insulating wax.

This wax has a melting point of approximately 215 degrees Fahrenheit, and may be used for sealing screw heads and live metal parts in electrical fittings where such sealing is required by rules of the National Electrical Code.

Approved March 19, 1914.

MUSICAL INSTRUMENTS.—The Rudolph Wurlitzer Company, Wurlitzer Station, Niagara County, N. Y.

Automatic pianos and orchestras operated pneumatically by a motor-driven bellows contained within the instrument cases. One-quarter horsepower and less, 110 and 220 volts, alternating current and direct current.

Approved March 19, 1914.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

PANELBOARDS.—Warder, Clark & Chaplin Electric Company, Incorporated, 406 East Main Street, Rochester, N. Y.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each panelboard.

Approved March 4, 1914.

RECEPTACLES, Standard. — National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Keyless, 660 watts, 250 volts.

Catalog No. 399, for use on metal ceilings.

Approved February 10, 1914.

SOCKETS, Standard. — The Arrow Electric Company, Hartford, Conn.

"Arrow E" brass shell sockets.

Key, 250 watts, 250 volts; catalog Nos. "Arrow Forty" 8,000, 8,001, 8,002, 8,006, 8,028, 8,033, 8,060, 8,062; "Arrow Twenty" 7,546, 7,548, 7,550, 7,552, 59,470, 59,481.

Key, 660 watts, 250 volts; catalog Nos. "Arrow Forty" 8,000W, 8,001W, 8,002W, 8,006W, 8,028W, 8,033W, 8,060W, 8,062W; "Arrow Twenty" 7,500W, 7,503W, 7,506W, 7,509W, 7,546W, 7,548W, 7,550W, 7,552W, 59,470W, 59,480W, 59,481W, 59,383W, 59,486W.

Keyless, 660 watts, 250 volts; catalog Nos. "Arrow Forty" 8,034, 8,061, 8,063; "Arrow Twenty" 7,547, 7,549, 7,551, 7,553, 59,471.

Pull, 250 watts, 250 volts; catalog Nos. "Arrow Forty" 8,513, 8,530, 8,531; "Arrow Twenty" 4,547, 4,549, 4,551, 4,553, 65,249.

Also above types with shadeholders attached; key type with composition or insulated metal key.

Approved March 19, 1914.

SOCKETS, Standard.—The Arrow Electric Company, Hartford, Conn.

"Arrow E" brass shell electrolier sockets.

Key, 250 watts, 250 volts; catalog Nos. 7,000, 7,002, 7,004, 7,010, 7,014, 7,017, 7,021, 7,024, 7,027, 7,030, 7,062, 7,068.

Keyless, 660 watts, 250 volts, short shell; catalog Nos. 7,003, 7,005, 7,061, 7,063, 7,066, 7,067, 7,069, 7,072-7,075 inclusive. Long shell; catalog Nos. 7,009, 7,011, 7,013, 7,015, 7,018, 7,020, 7,022, 7,025, 7,028, 7,031, 7,064, 7,070.

Pull, 250 watts, 250 volts; catalog Nos. 7,016, 7,019, 7,029, 7,032, 7,065, 7,071.

Keyless, 1,500 watts, 250 volts; catalog Nos. 5,000, 5,001.

Candle fixture socket, keyless, 660 watts, 250 volts; catalog No. 4,004, when installed with outer casing or "candle."

Also above type with shadeholder attached.

Approved March 18, 1914.

SWITCH BOXES.—Duncan Electric Company, Alton, N. H. "Gem." Cast-iron switch boxes for use with flexible tubing. Single, two and three-gang; catalog Nos. 14, 24 and 34. These boxes have lugs for supporting screws at one side and flanges for engaging laths at the other side.

Approved March 14, 1914.

SWITCHES, Push-Button Flush.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Push-button flush switches shown by tests and examinations conducted by Underwriters' Laboratories, to be in accordance with requirements of the National Board of Fire Underwriters, and examined and tested at factories and passed by Underwriters' Laboratories, have labels attached to each device.

Approved February 17, 1914.

TRANSFORMERS.—General Electric Company, Schenectady, N. Y.

"G. E." transformers, air-cooled for indoor and outdoor use with low-voltage incandescent lamps.

Type M. Sign-lighting transformers, 110 and 220 volts primary, 11 and 22 volts secondary, 250 to 2,000 watts.

Standard only when installed in accordance with Class *C* rules.

Approved March 19, 1914.

TUBING, Flexible.—The Insuladuct Manufacturing Company, St. Johns, P. Q., Canada.

Marking: "Insuladuct" stamped on the interior surfaces of the duck lining at intervals of 18 inches or less.

Flexible tubing shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, has label attached to tubing.

Approved February 21, 1914.

WIRES, Weatherproof.—National India Rubber Company, Wood Street, Bristol, R. I.

Tag on coil to read: "National Electrical Code Standard."

Approved March 12, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

PORTLAND, ME. — Carrabassett Light & Power Company has been incorporated for the purpose of owning, developing and operating water powers for general and special purposes. The capital stock is $50,000. G. H. Hinckley is president and J. F. Conner, treasurer.

ADAMS, MASS.—W. B. Plunket is to establish an electric power plant to light his summer home in Heartwellville, and it is understood that the capacity will be sufficient for the use of the village.

FARLEY, MASS.—A syndicate of Boston bankers allied with the house of C. D. Parker & Company, manager of a number of central stations in Massachusetts, has purchased real estate rights for the Franklin Power Company with the intention of developing hydroelectric power on Millers River at Farley, Mass. C. D. Parker, Bowen Tufts, Paul D. Webber and others are interested.

JERSEY CITY, N. J.—The City Centre Merchants' & Property Owners' Association has inaugurated a movement for the installation of a new brilliant electric street-lighting system along the business section of upper Newark Avenue. Michael Sexton is president. A.

NEWARK, N. J.—The Public Service Electric Company has been granted permission to install underground conduits in Park Place and Centre Street, from Broad to Mulberry Street. A.

SUMMIT, N. J.—The Commonwealth Water & Light Company is planning for the extension of its system at Florham Park; permission for the work has been asked. A.

TRENTON, N. J.—The Board of Public Utility Commissioners has approved an application of the Jersey Power Company for an issue of capital stock in an amount of $40,000. The company will devote the proceeds of the issue for the construction of a transmission line from Boonton *via* Fox Hills to Millbrook, from Millbrook to Dover, from Dover to Wharton, including a branch to Rockaway, a total line of 15.25 miles.

WHARTON, N. J.—The Jersey Corporation has acquired right of way for the erection of a new power-transmission line to Main Street. A.

SOUTH ATLANTIC STATES.

GREENVILLE, S. C.—A charter has been issued to the Buncomb Road Electric Light Company, with a capital of $500. The incorporators are H. Y. Thackston, president; W. M. Hamilton, vice-president; R. K. Taylor, secretary and treasurer. The company will operate an electric light plant.

CHIPLEY, FLA.—The Chipley Light & Power Company, will establish an electric light plant here at a cost of $10,000.

DAYTONA, FLA.—An electric-light plant will be established at Wilbur-by-the-Sea. Address J. W. Wilbur, Brookline, Mass., for desired information.

LEESBURG, FLA.—The Leesburg Ice Company, will enlarge its electric-light plant.

NORTH CENTRAL STATES.

BELLEFONTAINE, O.—Bellefontaine is preparing to equip its municipal light and water plant with turbine engines and continue to generate its own electric current and pump its own water. Address the village clerk for further information.

LOGAN, O.—The right of way for the high-tension transmission line of the Ohio Light & Power Company from this city to New Straitsville, a distance of 18 miles, has been secured, and construction work will begin shortly. J.

SEBRING, O.—A subscription list for raising funds to erect the proposed lights on Fifteenth Street is being circulated and it is meeting with success. Address the city clerk.

HUNTINGTON, IND.—A bond issue of $30,000 has been authorized for the purpose of reconstructing and enlarging the electric plant, which will furnish current for power and light.

MARTINSVILLE, IND.—The electric lighting system will be considerably extended, the improvements including an ornamental lighting system for the public square at an estimated cost of $1,000. G.

LANSING, MICH.—April 15 bids will be received for the construction of a combined electric-lighting and water-supply system at the Hanson State Military Reservation, near Grayling, Mich. Address Walter G. Rogers, Q. M., for particulars.

SUTTON BAY, MICH.—Sutton Bay Telephone Company has been incorporated with a capital stock of $4,950.

OGEMA, WIS.—The Ogema Telephone Company has been incorporated with a capital stock ranging from $3,500 to $7,000.

SIREN, WIS.—Siren Telephone Company has been incorporated with a capital of $2,500 by Charles Short, John Thader, Fred Johnson, John A. Anderson and Emil Johnson.

CLARA CITY, MINN.—The Montevideo Light & Power Company will build a line here from Sacred Heart and furnish power from Minnesota Falls.

TRUMAN, MINN.—A meeting was held to discuss electric lighting and the majority favored a municipal plant to cost $4,000. Address the city clerk.

WACONIA, MINN.—The Norwood-Young America Telephone Company has been granted a franchise. Charles A. Reilm is village recorder.

CLARINDA, IOWA.—The Lee Light & Power Company has been incorporated with a capital stock of $500,000. The concern has the lighting franchises for Clarinda, Gravity, New Market, Corning, Blanchard, College Springs, Braddyville, Shambaugh and also for wholesale light and power to the Bradford Light & Power Company.

EARLHAM, IOWA.— Bonds have been voted and bids will be asked for electric equipment. Address Dr. E. S. Day, mayor, for further information.

MANILLA, IOWA.—A $20,000 electric light plant will be installed. Address the city clerk.

NEVADA, IOWA.—Contract has been signed by the Iowa Railway & Light Company, and the Lookingbill & Enfield Company, of Maxwell, for electric service between Nevada and Maxwell. A transmission line will be so constructed as to handle a load of electricity sufficient to supply the needs of Maxwell, Collins and Rhodes.

PATON, IOWA.—At a special election held here it was decided to bond the town for the purpose of installing an electric light system.

KANSAS CITY, MO.—A power plant will be erected in Kansas City by the Christian Church, in connection with a new hospital. J. W. Perry, of the Christian Church Hospital Association, is in charge of plans. M.

KANSAS CITY, MO.—The Automatic Electric Light Company has been incorporated to do business in Kansas City with a capitalization of $100,000. The incorporators are William F. Warner, who is the principal stockholder; F. H. Willmont and W. H. Maloney. The company will manufacture and deal in automatic individual light plants for both domestic and other use. M.

SENATH, MO.—Senath Light & Power Company, has been incorporated with a capital stock of $10,000. The incorporators are W. W. Watson, J. L. Davis and Alvin Chapman.

LARNED, KANS.—$90,000 will be expended for a municipal light and power plant. Address the city clerk.

MARYSVILLE, KANS. — A plan for the harnessing of the Big Blue River has been outlined by Charles O. Beardslee and E. G. Ward, who have established offices here. It is proposed to establish four dams, and to secure about 6,000 horsepower with which to provide light, heat and power within a radius of 100 miles.

PFEIFER, KANS. — The Farmers' Telephone Company has been incorporated for $5,000 to build an exchange and several lines. M.

WESKAN, KANS.—The Kansas State Irrigation Board will establish a power plant for irrigating purposes near here. R. P. Hines, of Topeka, is chairman of the Board. M.

SOUTH CENTRAL STATES.

FULTON, KY.—Plant extensions are planned by the Fulton Electric Light & Power Company, during the year. G.

LOUISVILLE, KY. — Scottsville Electric Light Company, has been incorporated with a capital of $5,000 by J. D. Read, J. B. Dodson and H. L. Hendrick.

WHITESBURG, KY.—Henry Day, Samuel Collins, Stephen Combs and others have organized a $5,000 stock company to build an electric light plant here.

JOHNSON CITY, TENN.—A project for the construction of an electric light plant is being pushed by the Commercial Club. A franchise will be offered for sale shortly, and it is understood that it will be taken up at once.

MEMPHIS, TENN.—The Memphis Automatic Telephone Company has been incorporated with a capital stock of $2,000,000 by C. W. Thompson, J. B. Goodbar and others.

NASHVILLE, TENN.—Powell Valley Telephone Company has been incorporated with a capital of $1,000 by Boyd Miller, W. R. Lewis, L. C. Mullens, R. R. Miller and W. E. Kincaid.

GADSDEN, ALA.—A joint committee of the City Council and Chamber of Commerce recommended that a municipal electric light plant be established. Address J. H. Holcombe, mayor, for particulars.

COLUMBUS, MISS.—The Mississippi Electric Railway Company has been incorporated to construct and operate an electric railway in Mississippi. The incorporators are Charles E. Sherrod, G. T. Banks and others.

CORINTH, MISS.—A new motion-picture theater is being built here. Address Edward Machette, 402 Waldron Street, regarding the electrical equipment.

HOMINY, OKLA.—Hominy Light, Ice & Power Company, has been incorporated with a capital of $15,000 by Harry Askin, D. Mason and F. M. Overlees.

ALPINE TEX.—Alpine Light & Ice Company has been incorporated with a capital of $20,000 by J. D. Jackson, S. D. Harmon and George Miller.

CARLSBAD, TEX.—The Texas Tuberculosis Sanitarium Company is having plans prepared for an electric light plant to cost $9,000. D.

DALLAS, TEX.—The Kelmont Electric Company has been organized here with a nominal capital of $5,000. Its purpose is to construct electric and belt railways in and near Dallas. J. A. Sanders is interested. D.

DAYTON, TEX.—J. B. Sterling and associates will construct an electric light and power plant here. D.

FORT WORTH, TEX.—The Fort Worth-Denton Interurban Railway Company contemplates the construction of an electric road between Fort Worth and Mineral Wells, Tex. Work probably will begin as soon as the Fort Worth-Denton line is completed. E. E. Baldridge, Fort Worth, is president. M.

FRANKLIN, TEX.—A bond issue of $17,500 has been voted here for the purpose of installing an electric light plant and waterworks plant to replace those recently destroyed by fire. D.

WESTERN STATES.

FORT BENTON, MONT.—Articles of incorporation of the Floweree Mutual Telephone Company have been filed, capitalized at $20,000. The incorporators are R. E. Baker, R. D. Lohr, M. Sinclair, and others of Floweree. The Company purposes establishing and carrying on a telephone business in Choteau and Cascade Counties, with headquarters in Floweree. O.

MISSOULA, MONT.—M. D. Flynn, of Potomac; W. L. Stockton, of Clearwater, and others recently filed articles of incorporation for the Big Blackfoot Telephone Company, capitalized at $10,000. The Company will build the telephone line from Missoula to Bonner, to Potomac, and from there to Ovando.

PHILLIPSBURG, MONT. — The Royal Basin Mining Company, operating at Maxville recently announced its intention of installing an electric power plant at the North Star Copper mines near here. O.

ALAMOGORDO, N. M.—The Alamogordo Light & Power Company has been organized here with a capital stock of $25,000. W. R. Eidson is interested. D.

POCATELLO, IDAHO. — Harry Schildhauer, M. J. Sweeley and H. A. Stroud recently filed articles of incorporation of the Idaho Pacific Railway. The Company purposes building 100 miles of interurban railway to connect Twin Fall County with the Haggerman Valley. The Company is capitalized at $250,000. For further information address Henry Schildhauer, treasurer. O.

NOGALES, ARIZ.—Announcement has been made that the Mountain States Telephone & Telegraph Company will begin in May the installation of a new telephone system in this city.

BUCKLEY, WASH.—The Buckley Electric Company has been granted a franchise for an electric system in this city.

SPOKANE, WASH.—The Salmon River Power & Light Company has been organized with a capital stock of $400,000 for the purpose of developing power near Shannon, in Idaho. H. M. Boomer, C. L. Mackenzie and Edward Rigg are amoug those interested in the proposition.

WILSON CREEK, WASH.—Grant County Power Company, has been incorporated with a capital of $40,000 by D. O. Friel, S. W. Roberts and Barton Morgan.

GLENDALE, ORE.—The California-Oregon Power Company has been granted a 50-year franchise to maintain an electric distributing system in this city.

GRANTS PASS, ORE.—The Rogue River Public Service Corporation recently filed an application with State Engineer John H. Lewis for a right to install the second largest power plant in the state of Oregon at Hells Gate, on the Rogue River, near this city. The project includes the construction of a dam 200 feet high. The proposed plant, it is understood, will develop 41,320 horsepower. O.

PORTLAND, ORE.—S. Carver, promoter of the Portland & Oregon City Railway Company, has outlined a system of new interurban electric car lines, connecting this city with Damascus *via* Happy Valley, and Stone and Logan *via* Harmony, Clackamas and Clear Lake.

CALISTOGA, CAL.—The Commission has granted authority to the Napa Valley Electric Company to serve consumers in Napa Valley from Bale station to the northerly limits of Napa County except the town of Calistoga, which is served by the Calistoga Electric Company.

FRESNO, CAL.—The San Joaquin Valley Telephone Company has been incorporated with a capital stock of $10.000 by Frank H. Edwards, James M. O'Brien and Luther P. Spalding, for the purpose of building a telephone line from Graham to Jameson.

HARBOR, WASH.—A. R. Byrd has been granted the franchise for an electric light system here.

LOMPOC, CAL.—Representatives of the San Joaquin Light & Power Company have been investigating conditions with a view of extending the company's lines into this valley.

SAN FRANCISCO, CAL.—Articles of incorporation have been filed here for the Fresno Interurban Railway Company, with a capital stock of $250,000, by G. H. Bradner, J. B. Rogers and P. F. Fratessa.

SOUTH PASADENA, CAL.—Electricizing the Santa Fe Railroad from Pasadena to Los Angeles is the latest suggestion for solving the traffic problem between these two cities.

TERRA BELLA, CAL.—The Mt. Whitney Power Company will begin shortly the erection of substation one mile east of this city.

DAWSON, Y. T.—This city is preparing to install a municipal telephone, water, light and power plant, and the Civic League, comprising the leading citizens of the city, has taken up the matter of raising $200,000 to defray the cost of installation. O.

HOLLY, COLO.—The present telephone service given by the Holly Telephone Company is unsatisfactory and a new company will be organized. J. Habiger is interested.

NEW PUBLICATIONS.

LONG-DISTANCE TELEPHONY.—The article in the *Electrician* by Bela Gati entitled "The Use of Telegraph Lines for Long-Distance Telephony" has been issued as a reprint.

LABORATOIRE CENTRAL.—Vol. III of the "Travaux du Laboratoire Central d'Électricité," covering the year 1912-1913, has been published by the director, P. Janet, under the auspices of the Société Internationale des Electriciens.

WISCONSIN ASSOCIATION PAPERS.—The papers presented at the sixth annual convention of the Wisconsin Electrical Association, held at Milwaukee, January 15 and 16, have been published in pamphlet form by the Association, of which the secretary is George Allison, of Milwaukee.

TELEPHONE POLES. — Bulletin No. 67 of the United States Department of Agriculture is entitled "Tests of Rocky Mountain Woods for Telephone Poles," by Norman D. Betts and A. L. Heim. This gives the results of a number of tests for mechanical strength upon poles of western red cedar lodgepole pine and Engelmann spruce. Results are also given of some tests by the Pacific Telephone & Telegraph Company.

NEW INCORPORATIONS.

NEW YORK, N. Y.—The Hamilton Electric Company has been incorporated, capitalized at $10,000, by J. G. Feldman, M. Goldman and I. Rottenberg.

ST. LOUIS, MO.—Shiras Electric Company has been incorporated with a capital stock ranging from $40,000 to $150,000.

BROOKLYN, N. Y.—Phoenix Electric Lamp Company, Incorporated, has been incorporated, capitalized at $1,000, by Charles O'Sullivan, Michael J. Villamena and F. I. Connolly, all of New York City.

HOUSTON, TEX.—Federal Sign System (Electric) of Texas has been granted articles of incorporation, capitalized at $10,000. The incorporators are James M. Gilchrist, P. G. Dedmon and F. B. Potter.

COVINGTON, KY.—Electrically-driven machinery will be used in the plant of the Liberty Cherry & Fruit Company, recently incorporated with a capital stock of $10,000 by Edgar Bettman and others. G.

WILMINGTON, DEL.—National Transportation & Electric Service Corporation has been incorporated with a capital stock of $2,500,000. The incorporators are Herbert E. Latter, W. J. Maloney. Oscar J. Reichard, all of this city.

PEORIA, ILL.—Kiso Electric Company has been incorporated to manufacture electric-lighting systems and accessories. The capital stock is $50,000 and the incorporators are W. K. Kiso, J. H. Lockwood and H. D. Clarke.

NEWARK, N. J.—Dennison & Buck Company has been incorporated to manufacture electrical goods. The capital stock is $50,000 and the incorporators are M. Cohen, Brooklyn, N. Y., I. Simon and B. Strauss, of New York City.

LUZERNE, N. Y.—The Riddell Electric Light Company, Incorporated, has been granted articles of incorporation, capitalized at $10,000. The incorporators are Edward E. Riddell, Myron B. Riddell and Edward J. Riddell, all of this place.

RANDOLPH, N. Y.—Randolph Light & Power Company, Incorporated, has been incorporated with a capitalization of $20,000. The incorporators are Albert J. Woodworth, Grace D. Woodworth and Joseph W. Grace, all of this place.

WORCESTER MASS.—American Model & Instrument Company has been incorporated with a capitalization of $50,000 to deal in electrical and mechanical devices. The incorporators are W. W. Johnson, J. V. Critchey, C. J. Rohland, Worcester.

ROCHESTER, N. Y.—The Rochester Electric Contracting Company, Incorporated, has been granted articles of incorporation. The capital stock of the company is $10,000 and the incorporators are Richard G. Finucane, Bernard E. Finucane and John J. Finucane, all of this city.

NEW YORK, N. Y.—Shotwell Electric Weather Vane Company, Incorporated, has been granted articles of incorporation, capitalized at $1,000. The incorporators are Willetts H. Shotwell, Glen Cove, of New York City, and Henry A. Ingraham and Edward M. Thomas, of Brooklyn, N. Y.

PROPOSALS.

ELECTRIC LIGHTING SYSTEM.—April 30 bids will be received for labor and materials required in the construction of an electric lighting system for Elk Point, S. D. Address A. Smythe, city auditor.

TURBOGENERATOR UNIT.—Bids will be received April 16 for furnishing and installing one turbogenerator unit and condenser for the city water and light plant, Columbia, Mo. Address John S. Bicknell, city clerk.

ELECTRICAL SUPPLIES.—Bids will be received April 20 for furnishing of supplies for the City Electric Light Plant, Indianola, Iowa, for the purposes of the city for the fiscal year ending April 1, 1915. Address W. A. Graves, city clerk.

DRY BATTERIES.—Sealed proposals will be received at the office of the Depot Quartermaster, United States Army, Jeffersonville, Ind., until May 1 for furnishing 36 dry batteries under Schedule 870. Joseph T. Davidson is Major of the Quartermaster Corps.

GENERATORS—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 5, for furnishing two 900-kilowatt 200-volt generators, as per Schedule 6603, for delivery at the Navy Yard, Brooklyn, N. Y.

MOTOR-DRIVEN MACHINERY.—Sealed proposals will be recieved by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until May 19 for furnishing various motor-driven machines, for delivery at the Navy Yard, Mare Island, Cal., as per Schedule 6638.

ELECTRICAL EQUIPMENT.—Bids will be received on April 20 for one 150-gallon electrically driven centrifugal pump; two 80-horsepower boilers, one feed pump and heater, one 90-horsepower high-speed automatic engine; one 60-horsepower generator and switchboard, etc. Address J. McR Bracy, mayor, Rowland, N. C.

SUBMARINE ELECTRIC CABLE.—Sealed proposals will be received at the office of the Lighthouse Inspector, Detroit, Mich., until April 21 for furnishing submarine electric cable for light and fog signal station at Ashland, Wis. Blank proposals, etc., may be obtained from the Lighthouse Inspector, Post Office Building, Detroit, Mich.

MOTOR-GENERATOR SETS.—Sealed proposals will be received at the Engineer Depot, United States Army, Washington Barracks, D. C., until May 7 for furnishing two motor-generator sets, capacity 10 kilowatts, 115 volts direct current, together with necessary starting compensators and field rheostats. Joseph E. Kuhn is the Lieutenant Colonel of Engineers.

ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the Purchasing Agent, Commissioners of the District of Columbia, Washington, D. C., until April 27 for furnishing one voltmeter, two ammeters and one millivoltmeter, and 10 battery jars, 10 pounds copper wire, 5 pounds magnet wire, 50 electric carbon lamps, 100 lamp receptacles, 3 plugs, 3 caps, 4 large primary and secondary coils and 4 dynamos for the Business High School. For further information address the Purchasing Agent at Washington, D. C.

FINANCIAL NOTES.

Directors of the American Light & Traction Company have re-elected officers. Secretary C. N. Jelliffe was also elected second vice-president.

At the annual meeting of the Cities Service Company, stockholders authorized an increase in the capital stock from $50,000,000 to $65,000,000. Paul R. Jones was elected a director to succeed W. F. Hoffman, deceased. Other directors were re-elected.

The Utah Power & Light Company has filed a trust deed with the Guaranty Trust Company and William C. Cox, trustee, to secure a $100,000,000 thirty-year five-per-cent bond issue, payable February 1, 1944. The issue will be used to take up $22,000,000 Utah Securities short notes, and $10,000,000 of the bonds have been sold.

The United States Light & Heating Company at a special stockholders' meeting held at Portland, Me., approved an issue of $1,500,000 fifteen-year six-per-cent first-mortgage serial bonds. The company has no outstanding bonds. It is proposed to use the proceeds of this issue for additions and betterments of the company's property.

Southern Canada Power Company, recently incorporated, has taken over the South Shore Power & Paper Company, the St. Johns Electric Light Company and the St. Hyacinthe Gas, Electric & Power Company. The new company also controls three water power sites on the St. Francis River. The new company has an authorized capitalization of $3,000,000 stock and $3,000,000 bonds, of which $2,000,000 of the stock and $572,500 bonds have been issued. Floating debt of the underlying companies has been provided for and bonds and common stock of the new company will be taken in exchange for a part of the securities of the old companies. It is estimated that the earnings will provide for all bond interest and leave a balance of $7,000.

The city of Chicago will receive $3,299,000 as its share of the net earnings for the last year of the surface railways, according to the annual reports of the companies just made public.

Under the terms of a franchise granted the surface lines eight years ago, the city receives 55 per cent of the net earnings. The traction fund which has accumulated amounts to about $14,000,000.

Dividends.

	Term.	Rate.	Payable.	Date. Record
*Am. Lt. & Trac.	Q	2.5 %	May 1	
Am. Lt. & Trac. pf.	Q	1.5	May 1	
Bklyn. City R. R.	Q	2.	April 15	April 8
Comnwlth Edison.	Q	2.	May 1	April 15
Edison, Bklyn.	S-A	$4.	May 1	April 18
Elec B & S Com.	Q	2.	April 15	April 14
Elec B & S pf.	Q	1.5	May 1	April 22
FtWorth P&Lt pf.	Q	1.75	May 1	April 22
Gd. Rapids Ry pf.	Q	1.25	May 1	April 15
Nat'l Carbon pf.	Q	1.75	May 15	April 15

*And 2.5 per cent.

Reports of Earnings.

PUBLIC SERVICE CORPORATION OF NEW JERSEY.

The Public Service Corporation of New Jersey has issued its report for the year ended December 31, 1913. The combined income account of the Public Service Corporation and affiliated corporations compares as follows:

	1913.	1912.
Gross revenue	*$37,279,319	$34,593,808
Expense taxes and amortization	19,852,198	18,501,512
Net revenue	17,427,121	16,092,297
Charges, etc.	15,178,922	14,039,071
Surplus	†2,248,199	2,053,224

*Including miscellaneous income.

†Equal to 8.99 per cent on $25,000,000 capital stock against 8.21 per cent on same stock previous year.

MONTANA POWER COMPANY.

The Montana Power Company reports for the year ended December 31, 1913, as follows:

Gross	$3,532,162
Net after charges	2,414,388
Total income	2,421,424
Surplus after charges	1,516,869
Preferred dividend	677,026
Common dividend	536,635
Surplus	303,208

UTAH SECURITIES CORPORATION.

Utah Power & Light Company and Western Colorado Power Company subsidiaries of Utah Securities Corporation report combined earnings for February, 1914, and the six months and 12 months ended February 28 as follows:

	1914.	1913.
February gross	$ 168,445	$ 132,799
Net after taxes	92,552	79,211
Six months' gross	963,232	765,100
Net after taxes	556,716	420,659
Twelve months' gross	1,828,978	1,503,122
Net after taxes	1,086,560	809,972

AMERICAN POWER & LIGHT.

Two operating subsidiaries of American Power & Light Company report as follows for February and the twelve months ended February 28, 1914:

	1914.	1913.
Pacific Power & Light:		
February gross	$ 106,023	$ 99,021
Net after taxes	54,337	46,306
Surplus after charges	23,070	20,756
Twelve months' gross	1,301,763	1,258,208
Net after taxes	642,297	613,084
Surplus after charges	289,018	323,346
Balance after preferred dividends	44,018	84,596
Kansas Gas & Electric:		
February gross	$ 115,461	$ 100,693
Net after taxes	41,855	34,638
Surplus after charges	27,129	20,581
Twelve months' gross	1,063,671	957,411
Net after taxes	387,353	327,997
Surplus after charges	210,600	168,228
Balance after preferred dividends	105,600	63,228

WASHINGTON RAILWAY & ELECTRIC.

The Washington Railway & Electric Company reports for the year ended December 31, 1913, compared as follows:

	1913.	1912.
Gross earnings	$4,943,315	$4,648,328
Expense and taxes	2,669,972	2,528,224
Net	2,273,343	2,120,104
Other income	10,222	13,233
Total income	2,283,565	2,133,337
Fixed charges	1,126,916	1,107,607
Surplus	1,156,649	1,025,730
Preferred dividends	425,000	425,000
Surplus	*731,649	600,730
Common dividends	422,500	260,000
Surplus	309,149	340,730

*Equal to 11.25 per cent on $6,500,000 common stock, as compared with 9.24 per cent earned on same stock in previous year.

CANADIAN GENERAL ELECTRIC COMPANY.

The report of the Canadian General Electric Company for the year ended December 31, 1913, shows gross profits of $2,029,898, an increase of $18,180. The income account compares as follows:

	1913	Increase
Gross profits	$2,029,898	$ 18,180
Depreciation	470,933	14,575
Balance	$1,558,966	$ 3,605
Interest	222,655	63,778

CITIES SERVICE PROFITS UP.

The report of the Cities Service Company for the fiscal year ended February 28, 1914, shows net earnings of $2,571,241, against $1,218,367 the preceding year. The income account compares as follows:

	1914.	1913.
Gross	$2,657,931	$1,284,868
Net	2,571,241	1,218,367
Surplus after charges	2,389,845	1,218,367
Preferred dividend	1,055,510	636,564
Surplus	1,334,335	581,803
Common dividend	556,408	250,166
Balance	777,927	331,637

President Henry L. Doherty, in his remarks to the stockholders, says: "Although general business conditions throughout the country have been below normal, it is gratifying to note the continued increase in the company's earnings, thus bearing out the oft-repeated statement that public utilities' earnings are not seriously affected by periods of business inactivity.

"Since the last report the earnings of the company, after deducting expenses and interest charges, have increased from 1.91 to 2.25 times the dividends on the preferred stock and the percentage of earnings to common stock has increased from 9.82 to 11.06 per cent."

WESTERN ELECTRIC COMPANY.

The Western Electric Company has issued its report for the year ended December 31, 1913. The income account compares as follows:

	1913	1912	1911
Gross sales	$77,532,860	$71,727,329	$66,211,975
Other income	720,556	1,194,010	337,293
Total income	78,253,416	72,921,339	66,549,268
Manufacturing costs, expenses, etc.	71,689,555	67,211,339	62,414,067
Net earnings	6,563,861	5,710,000	4,135,201
Charges	892,166	856,735	854,909
Surplus	*5,671,695	4,853,265	3,280,292
Dividends	1,500,000	1,500,000	1,500,000
Reserve	2,500,000	2,000,000	800,000
Employes' benefit		285,855	
Surplus	1,671,695	1,067,410	980,292

*Equal to 37.81 per cent earned on $15,000,000 capital stock compared with 32.36 per cent earned on same stock previous year.

President H. B. Thayer says:

"In view of the prospect of a smaller business in our own products in 1914, and some changes in types, it has seemed advisable to apply more than the usual depreciation to our valuation of completed merchandise.

"We have hitherto merged in our accounts our foreign investments in plant, merchandise and accounts receivable. This year we have segregated these items, and the item "sundry investments" includes all investments outside of the United States. This change in accounting has necessarily decreased other accounts, particularly plant and merchandise accounts, and has correspondingly increased the "sundry investments" account.

"A large part of our manufacturing plant is of recent construction and, therefore, the standard rates of depreciation reserve have not sufficed to produce a net valuation as low as conservative accounting would dictate on a highly specialized plant, nor as low as the valuations of other manufacturing plants comparable with ours. We have, therefore, applied this year an extra depreciation to our plant accounts which we have charged to reserve for contingencies."

AMERICAN GAS & ELECTRIC.

Five subsidiaries of the American Gas & Electric Co. report for the twelve months ended February 28, 1914, as follows:

	1914.	1913.
Canton Electric:		
Gross earnings	$441,064	$351,027
Net after taxes	217,021	176,016
Surplus after charges	153,536	119,348
Muncie Electric Light:		
Gross earnings	458,749	404,366
Net after taxes	193,985	168,129
Surplus after charges	107,583	85,406
Rockford Electric:		
Gross earnings	471,315	422,744
Net after taxes	253,766	214,919
Surplus after charges	156,734	120,352
Scranton Electric:		
Gross earnings	990,643	810,191
Net after taxes	613,833	464,099
Surplus after charges	403,414	309,635
Wheeling Electric:		
Gross earnings	318,275	265,869
Net after taxes	152,379	119,894
Surplus after charges	83,735	55,955

CANADIAN WESTINGHOUSE COMPANY.

The report of the Canadian Westinghouse Company, Ltd., for the year ended December 31, 1913, shows net earnings of $1,022,619, against $1,050,124 the previous year. The balance available for dividends was $923,919, equal to 18.5 per cent on the capital stock, as compared with 21.23 per cent earned in 1912. The income account compares as follows:

	1913.	1912.
Net earnings	$1,002,619	$1,050,124
Deposits and revenues.	50,000	50,000
Interest	28,700	.....
Balance	$ 923,919	$1,000,124
Dividends	445,027	399,762
Surplus	$ 478,892	$ 600,362
Previous surplus	1,302,599	1,050,845
Total surplus	$1,781,491	$1,651,207
Written off property and plant	250,000	348,606
P. and L. surplus	$1,531,491	$1,302,601

Vice-president H. H. Westinghouse, in his remarks to the stockholders, says:

"The year opened with a good volume of orders brought forward from 1912, and with a satisfactory influx of new business during the earlier months, which together carried this year's shipments to a new maximum notwithstanding a falling off in activity during the closing months. This later reduced rate of activity was the company's share in the widespread and cumulative curtailment of trade which, starting in the West, had by the year's end made its influence felt by practically every industry in Canada. Consequent reduced forces and shortened hours of manufacture have operated to reduce somewhat the ratio of profit. The diminution in receipt of orders has been accompanied by little if any cessation in activity of those departments having to do with inquiry and quotation, and this with the growing tendency to easier money conditions is the present favorable feature."

CLOSING BID PRICES FOR ELECTRICAL SECURITIES OF THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 13.	April 6.
American Tel. & Tel. (New York)	120	122
Commonwealth Edison (Chicago)	137	139
Edison Electric Illuminating (Boston)	255	256
Electric Storage Battery common (Philadelphia)	52	52
Electric Storage Battery preferred (Philadelphia)	52	52
General Electric (New York)	145	146
Kings County Electric (New York)	120	120
Manhattan Transit (New York)	1	1
Massachusetts Electric common (Boston)	11	11
Massachusetts Electric preferred (Boston)	61	61¼
National Carbon common (Chicago)	109½	108½
National Carbon preferred (Chicago)	119	117½
New England Telephone (Boston)	135	136
Philadelphia Electric (Philadelphia)	27	26⅝
Postal Telegraph and Cables common (New York)	82	82½
Postal Telegraph and Cables preferred (New York)	69	69
Western Union (New York)	62¼	62½
Westinghouse common (New York)	73½	74
Westinghouse preferred (New York)	117	118

PERSONAL MENTION.

MR. H. F. HOLLAND, western representative of the Simplex Electric Heating Company, has returned to Salt Lake City, Utah, after a month's time spent in California looking over the field there.

MR. FRANK H. SOMMER, Newark, N. J., counsel to the Board of Public Utility Commissioners, gave an address on "The Public Utilities Law" before the Union County Bar Association, at Elizabeth, N. J., on April 9.

MR. MORT H. DODGE, district manager of the Standard Electric Time Company, with headquarters at Seattle, Wash., supervised the recent installation of time service clocks for his company in Salt Lake City.

MR. VICTOR E. THURMAN, formerly with the Richfield (Utah) Light & Power Company is developing an invention of his own consisting of an electric illuminating sign to be attached to an incandescent or arc-lamp post on business streets for advertising purposes.

MR. GEORGE THEIS, JR., has taken over the general management of the Interurban Construction Company of Wichita, Kans., and will push the proposed electric road from Wichita to Hutchinson. Mr. Theis, who succeeds MR. O. A. DOYLE as general manager, hopes also to build to Salina by way of McPherson.

MR. BERNARD E. SUNNY, president of the Chicago Telephone Company has been elected president of the Commercial Club of Chicago. Associated with Mr. Sunny on the Executive Committee are Messrs. Alexander H. Revell, Thomas E. Donnelley, Joy Morton, Louis A. Ferguson and Frederick W. Upham.

MR. A. E. CARPENTER has been appointed general manager of the Lomira (Wis.) lighting plant and will take charge of the establishment April 15. Mr. Carpenter has been identified with the Eastern Wisconsin Railway & Light Company for the past seven years as meter tester and general trouble man.

MR. J. L. WHITE, for several years manager of the Dallas Division of the Oregon Power Company, has been transferred to Albany, Ore., as manager of the company's interests there, succeeding MR. H. E. MORTON, resigned. Mr. A. L. MARTIN, formerly manager of the company's property at Corvallis, will succeed Mr. White at Dallas and Mr. R. U. STEELQUIST has been appointed manager in Mr. White's place at Corvallis.

MR. FREDERIC P. VOSE, the well known attorney and secretary of the Electrical Credit Association, delivered a very interesting and instructive address before the Jovian Electrical League of Southern California, on Wednesday, April 8. The subject was "Electrical Credits." As usual, "Fred" convinced his hearers that what he did not know about the credit proposition was hardly worth knowing at all. A great deal of valuable information was absorbed by all present.

MR. A. L. POWELL, illuminating engineer of the General Electric Company, Newark, N. J., tendered an address on "Good Lighting as a Factor in the Safety First Movement" before the local Traffic Club, April 6. The lecture was illustrated with pictures showing methods of lighting factories, stores, streets, trolley cars, trains, etc.

MR. HARRY DEGOULIER KING, electrical engineer, has been appointed by the Common Council, Hoboken, N. J., to prepare new lighting specifications for a contract with the Public Service Electric Company.

MR. GEORGE A. HUGHES, president of the Hughes Electric Heating Company, accompanied by MR. W. L. OVERMAN, western representative of the same company, were in Salt Lake City last week opening up the electric-range business for their company, the Western Electric Company having arranged to carry a stock of their stoves. Mr. Hughes is enthusiastic over the prospects for electric heating, particularly in western states where so many electric companies have established special heating and cooking rates, which place the cost of cooking with electricity on a par with gas.

MR. A. G. MACKENZIE, of Salt Lake City, who for five years held a position with the Mountain States Telephone & Telegraph Company in its Public Relations Department, has been appointed secretary of the Utah-California Expositions Commission. Prior to entering the electrical field, Mr. Mackenzie was engaged in newspaper work for several years. He left the telephone company to become assistant secretary and publicity director of the Salt Lake Commercial Club, where he remained a year, at the end of which time he established a publicity and advertising agency which he now conducts. He is a member of the Utah Electric Club and the Jovian Order, and takes an active interest in all things electrical.

MR. E. W. P. SMITH has been appointed city electrician of Cleveland, O. Mr. Smith was graduated in electrical engineering from Colorado College, Colorado Springs, in 1908. After a year of operating experience in the West he entered the employ of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, in the railway engineering department. An article on single-phase commutator motors by Mr. R. H. Hellmund and Mr. Smith, was published in the *Electric Journal* in 1912. Mr. Smith was later employed by the city of Cleveland, in the Smoke Prevention Division, where a preliminary report on the electrification of steam railroads in the city of Cleveland was prepared. During the latter part of 1913 he was in the mechanical department of the Lake Shore & Michigan Southern Railroad. Mr. Smith is an associate of the American Institute Electrical Engineers, a member of the American Electric Railway Association, and a member of the Cleveland Engineering Society.

MR. STEPHEN L. COLES has resigned the secretary-treasurership of The Society for Electrical Development, effective April 15. As of the same date he has joined the engineering staff of M. W. Thompson, 111 Broadway, New York City, specialist in litigated engineering matters and in reports on railroad and other large properties. Mr. Coles will devote his attention principally to electrical public utilities having problems of service, policy and competition to solve. He has grown up with the electrical industry, his first work having been with the old New England Wiring & Construction Company, of Boston, in installing an isolated electric lighting plant at Springfield, Mass., in 1889, for the Boston & Albany Railroad. Since August 1 last, Mr. Coles has been acting secretary-treasurer and secretary-treasurer of The Society for Electrical Development and has concentrated his well known energies on doing his share toward making the Society an accomplished fact and actual reality. One of his latest efforts in behalf of the Society was an article under his signature in the Public Utilities Number of *The Evening Post*, New York, March 30, giving data regarding the objects and formation of the Society and the educational work it expects to do.

MR. HENRY HINE, of Colorado Springs, Colo., a pioneer in electrical work, formerly with the United States Electric Lighting Company, of New York; afterward at the head of the Stanley Electric Manufacturing Company, Pittsfield, Mass., and now representing large interests in hydroelectric development in the United States and Mexico, is now visiting in New York City. Mr. Hine entertained at the Hotel Biltmore the former Committee on Membership of the old Electric Club of New York, and in addition to the Committee, the former secretary and treasurer of that Club. The party consisted of the following-named gentlemen: Mr. Henry Hine, chairman of the Electric Club Membership Committee; Mr. Henry D. Lyman, member of the Committee; Lieut. F. W. Toppan, U. S. N., member of the Committee; Mr. Geo. T. Manson, member of the Committee; Capt. Willard L. Candee, former treasurer of the Electric Club; and Mr. Charles W. Price, former secretary of the Club. The autographed menus of the occasion carried the following inscription: "At the Biltmore, on April 7, 1914, the following officers of the Electric Club met for the first time in 26 years—1888-1914." The occasion was a particularly enjoyable one, the menu one of the best ever provided by the new Biltmore, and the reminiscences were many, varied, and particularly interesting. The only absent member of the Committee was George Worthington, who died in 1892, and who was one of the founders of the Electric Club.

OBITUARY.

MR. R. C. BLISS, a pioneer telegrapher and at one time manager of the Cincinnati district for the Western Union Telegraph Company, died at his home in Cincinnati, on March 11.

MR. HANFORD C. ADAMS, vice-president of the Southern Utilities Company of Florida, died in Jacksonville, Fla., on March 11. At one time he was a Methodist minister in Lenox, Mass., where his father, the Rev. Lucius C. H. Adams, now of Nyack, N. Y., occupied a pulpit for many years. Mr. Adams was 28 years old.

MR. JOHN McNAMEE, builder of subways and elevated railroads, banker and philanthropist, died in his home in Brooklyn, N. Y., on April 7. He was 72 years old and is survived by his wife, a son and a daughter. After serving as an engineer in the Department of Public Works of Brooklyn for many years Mr. McNamee participated in the construction of the Brooklyn elevated railroads. He built the water

works at Portsmouth, Va., and Montclair, N. J., and as a member of the firm of Cranford & McNamee built the existing Interborough subway in Brooklyn and that section of the Centre Street subway in Manhattan between Canal and Broome Streets. Mr. McNamee served from 1880 to 1902 on the Brooklyn and New York City Boards of Education. He was for three years a member of the Prison Commission and for many years had been a leading member of the Society for the Prevention of Cruelty to Children. He gave liberally to many charities. He was a director of the Kings County Trust Company, Brooklyn Trust Company, the Brevoort Savings Bank and the National Water Meter Company. He also was president of the Eagle Warehouse Company.

MR. FRANK B. KNIGHT, special agent of the Southwestern Telephone and Telegraph Company, one of the best known and most highly esteemed men in the electrical fraternity, a pioneer in the industry, died at Dallas, Tex., on April 1. Mr. Knight was born at Canandaigua, N. Y., December, 1848. He learned to telegraph at the age of 14, on the line of the old New York, Albany & Buffalo Telegraph, at Geneva, N. Y. Shortly after this he was employed in the Syracuse office of the New York Central Railroad. After a short service there he was seized with the war fever and entered the United States Military Telegraph Corps, and was assigned to Burke's Station, on the Orange & Alexandria Railroad, and later transferred to Newport News, Va., at which place was an extensive war supply depot, afterwards designated and used as a prison for captured Confederates. Some time before the close of the war he was stationed at Fortress Monroe, as operator for the chief quartermaster of the Army of the James. At the close of the war Mr. Knight went to Rochester, N. Y., and entered the service of the Western Union Telegraph Company, continuing at various points until the beginning of 1870, when he was appointed chief operator of telegraphs of the Union Pacific Railroad Company at Omaha, which position he gave up in 1872, and became chief operator and afterwards manager of the Western Union Telegraph office at Omaha. It was at Omaha that he formed the acquaintance of Theodore N. Vail, which led to his employment in the Bell service. In the early part of 1880 he resigned to accept the position of special agent of the National Bell Telephone Company, but later left this company and engaged with the Palmer Wire Company. This company ultimately went out of business. Then he joined forces with Messrs. Beetle, Lytle and Down, in the general electric promoting business, finally reentering the service of the American Bell Telephone Company as special agent, eventually being located at Dallas, where he remained until the day of his death. In 1895 Mr. Knight was transferred to the Southwestern company as special agent, which position he held until his retirement on a pension a few months ago. He was married a second time in June last and had planned to take his bride for a visit to his daughter in Paris this summer. He leaves a son in the employ of the Southwestern company and a married daughter residing abroad. Mr. Knight's early employment in the telephone service necessitated much traveling and led to a wide acquaintance. He was a member of the Old Time Telegraphers' Association and the telephone Pioneers. He was a popular and greatly beloved member of both organizations, whose death will be greatly regretted by all who knew him.

DATES AHEAD.

Empire State Gas and Electric Association. Spring meeting, Alert Club, Medina, N. Y., April 22. Secretary, C. H. B. Chapin, 29 West Thirty-ninth Street, New York, N. Y.

Iowa Electrical Contractors' Association. First annual convention, Cedar Rapids, April 22-23. Secretary, M. T. Humphrey, Waterloo, Iowa.

Iowa Electrical Association. Cedar Rapids, Iowa, April 23-24. Secretary, H. B. Maynard, Waterloo, Iowa.

Iowa Street and Interurban Railway Association. Cedar Rapids, Iowa, April 23-25. Secretary, H. E. Weeks, Davenport, Iowa.

American Physical Society and American Institute of Electrical Engineers. Joint meeting, Washington, D. C., April 24-25.

Electrical Supply Jobbers' Association. May meeting, Chalfonte Hotel, Atlantic City, N. J., May 12-14. General secretary, Franklyn Overbagh, 411 South Clinton Street. Chicago, Ill.

Association of Railway Telegraph Superintendents. Annual meeting, New Orleans, La., May 19-22. Secretary, P. W. Drew, 112 West Adams Street, Chicago.

Southwestern Electrical and Gas Association. Annual meeting, Galveston, Tex., May 20-23. Secretary, H. S. Cooper, Dallas, Tex.

Cleveland Electrical Exposition, May 20-30. Manager, William G. Rose, Wigmore Coliseum, Cleveland, O.

Missouri Electric, Gas, Street Railway and Waterworks Association. Annual convention, on board steamer *Quincy* en route from St. Louis to Keokuk, Iowa, and return, May 21-23. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

National District Heating Association. Sixth annual convention, Rochester, N. Y., May 26-28. Secretary, D. L. Gaskill, Greenville Electric Light & Power Company, Greenville, O.

National Electric Light Association. Annual convention, Bellevue-Stratford Hotel, Philadelphia, Pa., June 1-5. General secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Michigan Section, National Electric Light Association. Annual convention cruise leaving Detroit, June 17, for the Thousand Islands and intermediate points, returning June 20. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich.

With the Electrical Manufacturers

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has removed its Atlanta, Ga., office to 1104-5-6 Healy Building.

Berkeley Electric Cooker Company, Berkeley, Cal., has undergone a change of management, L. C. Bishop now having charge of the business.

Berkeley Electric Cooker Company, port, Conn., has sent out new folders calling attention to some of the more important properties of its Phono-Electric trolley wire.

Dearborn Chemical Company, Chicago, Ill., has transferred its southeastern branch office from Birmingham, Ala., to 1407 Candler Building, Atlanta, Ga., where C. H. Everett and J. F. Boutelle, representing the Dearborn Company in that territory, will have their headquarters.

Wagner Electric Manufacturing Company, of St. Louis, Mo., announces the opening of a branch office in suite 524, Syracuse University Block, Syracuse, New York, in charge of J. W. Bryant, resident agent.

A. F. Daum Company, Pittsburgh, Pa., has issued bulletin No. J14 describing its ideal fuse strips. These fuse strips are made in a number of sizes, each size being ruled for various current-carrying capacities when desired.

Maxwell Electrical Company, 236 Fulton Street, New York City, announces that it has become manufacturing agent for National adjustable ground clamps, "BX" connectors, switch plates, service cutout boxes, wall cases for old or new work and porcelain material.

Naugle Pole & Tie Company, Chicago, Ill., has issued a pamphlet containing the Northwestern Cedarmen's Association specifications for white-cedar telephone poles. In addition to these specifications the pamphlet shows several views of the company's yards, and contains instructions and data for ordering poles.

Northern Electric Company, Limited, Montreal, Canada, announces that it has acquired the entire business and

undertakings of the **Imperial Wire & Cable Company, Limited,** and of the **Northern Electric & Manufacturing Company, Limited.** The new company will continue to operate the entire business without change in management.

Waterhouse Welding Company, Boston, Mass., has recently issued a pamphlet, entitled, "Welding and Cutting Plants." This pamphlet describes its acetylene welding and cutting outfits. These sets and their applications are fully described, numerous illustrations being used for this purpose. The company is offering these sets on a two-weeks' approval basis.

The Lunkenheimer Company, Cincinnati, O., has issued a new catalog devoted to motor accessories. The Lunkenheimer Company is a large manufacturer of high-grade engineering specialties. The new catalog is complete in detail both with respect to technical and practical information and descriptive matter, and also with respect to the illustrations of the specialties listed.

Societè Anonyme Industries Chimiques, Chiasso, Switzerland, has issued a pamphlet dealing with its insulating cement which is sold under the trade name Isolit. This product is a cement for binding porcelain insulators to iron pins. The pamphlet sets forth the properties of this material and gives various tests showing these and also other advantages which it possesses.

The High-Tension Electric Company, 321-325 Susquehanna Street, Indianapolis, Ind., has been organized to make and repair automobile ignition apparatus. A. H. Wagner, the manager, has had twenty years of experience in high-tension work, half of this time having been spent on automobile ignition. A. P. Robertson, the treasurer, has sold and handled cars almost since the beginning of the automobile industry.

The National Electric Specialty Company, Toledo, O., has issued catalog No. 11 on the Vac-M lightning arrester. The construction of this device is explained with the aid of numerous illustrations, and the various forms of it as designed for use in railway block-signal work, fire-alarm, police and telephone circuits, and other similar purposes are described. The catalog includes also full data of each of the types.

The Robbins & Myers Company, Springfield, O., is distributing an illuminated portfolio of its advertising plans for 1914. This portfolio includes a number of newspaper and magazine advertisements, lantern slides, street car and window cards, and miscellaneous booklets and folders. An ordering blank for electrotypes, cuts, lantern slides, window and car cards, window transfer signs and imprinted booklets accompanies this portfolio, all such material being furnished free of charge.

The Ideal Electric & Manufacturing Company, Mansfield, O., takes justifiable pride in the receipt of an order which it has recently been given by the Duluth, Messaba & Northern Railway Company, Duluth, Minn. This railroad is a subsidiary of the United States Steel Corporation. The order calls for 32 25-horsepower, 440-volt, three-phase, 25-cycle squirrel-cage induction motors. These motors will be used for the electrical equipment of the new No. 5 iron-ore docks which are now near completion and are reported as being the largest iron-ore docks in the world. Each motor will operate a bank of 25 chutes.

W. A. Blonck & Company, Fisher Building, Chicago, have issued bulletin No. 6 dealing with the Blonck boiler-efficiency meter. This instrument is now made in three principal types, two of which are indicating instruments used for natural-draft and forced-draft boiler operation; the third type of instrument is a recording instrument used for either natural or forced-draft service. The bulletin describes these instruments and gives numerous illustrations, together with discussion, of the performance of the instruments during a variety of tests under different operating conditions. The advantages of the instruments are set forth and a long list of users is also given.

Current Electric Company, Chicago, Ill., is marketing an electric furnace for heating soldering irons which, it is claimed, is the best known method. Central stations and contractors have shown great interest in this furnace and orders have been received from all parts of the country. The furnace is adapted for delicate or heavy work and is a means of materially increasing the day load of central stations. The Current Company is making a special trial proposition the particulars of which will be furnished on request.

Sangamo Electric Company, Springfield, Ill., has recently issued an attractive bulletin on mercury-type direct-current watthour meters. This 32-page bulletin gives with much detail the theory, mechanical construction and advantages of these meters. The first few pages are devoted to a discussion of the various types of wathour meters. The principle and details of the mercury-type meter are then discussed, followed by about 10 pages devoted to a discussion of the performance, characteristics and to diagrams of connections, price lists, etc. One of the valuable features of this bulletin is the large number of cuts showing in detail the construction of all parts of the meters. About 40 illustrations are included, many of which are special drawings showing with much detail the entire construction of these meters.

Western Electric Company, Chicago, and New York City, has begun the distribution of the fifth edition of its copyrighted bulletin, "How to Figure Illumination—Also a Complete Catalog of Sunbeam Mazda Lamps," which is just off the press. This bulletin gives complete information for planning the illumination of interiors. Numerical tables necessary in laying out lighting installations for different classes of business are given in this bulletin, as well as other illumination data, such as figures giving efficiencies of lamps and comparative efficiencies of various types of reflectors, both glass and steel. A copy of this booklet will be mailed to anyone gratis, if request is made to the Western Electric Company at any of its branches.

Record of Electrical Patents.

Issued by the United States Patent Office, April 7, 1914.

1,092,141. Electropneumatic Brake Apparatus. E. H. Dewson and W. V. Turner, assignors to Westinghouse Air Brake Co. Includes electrically controlled means for effecting a reduction in the pressure at the triple valve.

1,092,151. Telegraphic Receiving Organism. I. Kitsee, assignor to American Telephone & Telegraph Co. A relay device including a relay, an inductorium and a polarized relay.

1,092,153. Cartridge Fuse. E. B. Mallory, assignor to Economy Fuse & Mfg. Co., Chicago, Ill. A refillable cartridge fuse.

1,092,154. Rewinding Mechanism. I. F. Manny, assignor to Selective Signal Co., Milwaukee, Wis. An electromagnetic spring-winding device.

1,092,178. Cathode for Electrolytic Furnaces. G. O. Seward and F. von Kügelgen, assignors to Virginia Laboratory Co., New York, N. Y. Has parallel portions in which the direction of the electric flow is opposite.

1,092,245. Electric Switch. G. W. Cravens, assignor to Delta-Star Electric Co., Chicago, Ill. A box-inclosed knife switch with external operating means.

1,092,252. Method of Constructing Secondary or Storage Batteries. G. Fuller, L. Fuller and G. J. A. Fuller, London, England. A mold for forming electrodes of trianguloid form having a central core.

1,092,253. Secondary or Storage Battery. G. Fuller, L. Fuller, and G. J. A. Fuller. An electrode constructed as described in 1,092,252.

1,092,255. Spark-Adjuster for Explosive-Engines. J. P. Gering, Schrag, Wash. Includes synchronous control of engine and ignition means.

1,092,266. Electric Signal Mechanism. W. K. Howe, assignor to General Railway Signal Co., Gates, N. Y. A motor-operated signal having a normal danger position.

1,092,267. Process of Making Storage-Battery Electrodes. H. C. Hubbell, Newark, N. J. Briquet of nickel oxide reduced by heat and alkali solution, ground, dried and rebriqueted.

1,092,281. Combined Motor-Starter and Circuit-Breaker. A. C. McWilliams, Chicago, Ill. A combined motor-starter and automatic circuit-breaker.

1,092,283. Relay. M. S. Morse, Oakland, Cal. Includes use of two electromagnets.

1,092,294. Receiving Apparatus for Alternative Wireless Telegraphy and Telephony. J. Schiessler, Baden, Austria-Hungary. Receiving circuit includes a resistance heated to incandescence.

1,092,307. Dental Instrument. J. L. Talbott and W. S. Wright, Lompoc, Cal. Contains an electric heating element.

1,092,322. Spark Plug. W. S. Witter, Toledo, Iowa. For electric ignition.

1,092,323. Electric Recorder. J. L. Zander, assignor to C. O. Sander, Irvington, N. J. Includes use of electric motor.

1,092,333. Refillable Fuse. F. D. Bryan, Middletown, Pa. A refillable cartridge fuse.

1,092,354. Fortune-Telling Apparatus. W. M. Hamilton, Philadelphia, Pa. An electrically operated device.

1,092,370. Electric Ignition Generator. B. Lawrence, Leyton, England. A starting trip including means for maintaining high speed upon reduction of engine speed.

1,092,383. Safety and Signaling Device for Railroads. D. C. Newton, Owego, N. Y., assignor of one-half to M. Lindeman. A track-operated electric signal system for engine cabs.

1,092,388. Water-Level Indicator. N. Podgursky, St. Petersburg, Russia. Submerged float-switch having a pendulum for making electrical contact.

1,092,398. High-Tension Discharge Apparatus. G. D. Rogers, Cleveland, O. For therapeutical purposes.

1,092,401. Sheet-Music Perforating Device. A. D. Saumell, New York, N. Y. Includes electromagnetic control of punching device.

1,092,404. Reversing Device for Combustion Engines. W. Seck, assignor to Robert Bosch, Stuttgart, Germany. Ignition system for a reversible engine.

1,092,410. Means for Rating Incandescent Lamps. A. J. Sweet, assignor to Westinghouse Lamp Co. Includes use of special photometer, voltmeter, and wattmeter or ammeter.

1,092,411. Electric Railway and Signaling System Therefor. L. H. Thullen, assignor to Union Switch & Signal Co. Danger signal operated upon unbalancing of rail resistance.

1,092,415. Automatic Service Switch. R. E. Wetter, Dallas, Tex. A solenoid-operated abnormal-voltage trip.

1,092,417. Ignition Apparatus. J. A. Williams, Cleveland, O. An induction coil for electric ignition.

1,092,420 Dynamo-Electric Machine. E. F. W. Alexanderson, assignor to General Electric Co. Includes use of auxiliary winding on pole faces.

1,092,450. Rear-End Searchlight. J. D. Perkins, Washington, D. C. Means for directing rays of electric searchlight obliquely upwards.

1,092,452. Device for Measuring Speed. W. H. Pratt, assignor to General Electric Co. Includes an alternating-current generator and a frequency indicator.

1,092,453. Device for Amplifying Variations in Electrical Currents. P. M. Rainey, assignor to Western Electric Co. A telephone repeater including the use of a microphone.

1,092,459. Railway Signaling. J. B. Struble, assignor to Union Switch & Signal Co. An alternating-current signaling system necessitating the sectionalizing of only one rail.

1,092,460. Railway Signaling. J. B. Struble, assignor to Union Switch & Signal Co. A modification of 1,092,459.

1,092,472. Connecting-Clip for Electrical Conductors. J. H. Breaznell, New York, N. Y. One wire is encircled by hook members, the other being held between extensions of the hook members. (See cut.)

1,092,489. X-Ray Tube. H. M. Kesselring, Chicago, Ill. A double wall provided for supporting one electrode.

1,092,498. Refillable Cartridge-Fuse. E. B. Mallory, assignor to Economy Fuse & Mfg. Co. Ends of fusible material clamped between washers and threaded ends of shell. (See cut.)

1,092,510 Lightning-Arrester. A. Allendorf, Harvard, Ill. A telephone arrester having fuses mounted on rotatable drum.

1,092,472.—Connecting Clip.

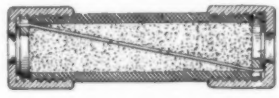
1,092,523. Submerged Electric Heater. B. Falkenberg, assignor to Pacific Electric Heating Co., Ontario, Cal. Resistance coil mounted in drum inside of main receptacle.

1,092,600. Primary Battery. C. B. Schoenmehl, Waterbury, Conn. Both elements mounted on insulated frame held by hangers engaging edge of jar.

1,092,627. Locking Device for Electric Lamps, etc. A. D. Bartlett, Washington, D. C. An electromagnetic locking device.

1,092,637. Telephone-Receiver Holder. S. Dusak, Seanor, Pa. An extension arm for a telephone receiver.

1,092,687. Spark Plug. J. De L. Barmore, Apalachicola, Fla. Center contact insulated by mica sleeve and disks, an asbestos filling being used at one end.



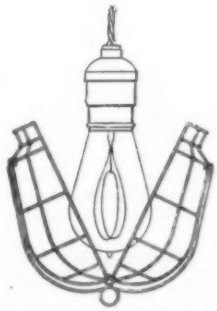
1,092,498.—Refillable Fuse.

1,092,708. Lamp-Guard. J. Gray, Jr., New Orleans, La. A wire-guard having two hinged sections. (See cut.)

1,092,724. Motor-Starter for Rectifier Systems. M. Kushlan, Boston, Mass. A motor for utilizing current in excess of that required by battery being charged.

1,092,732. Signal Device. J. H. McCarthy, Stafford Springs, Conn. A bell circuit energized by contact on rope caused to move upon the energizing of a magnet.

1,092,736. Automatic Time Contact-Switch. H. B. Meier, Port Chester, N. Y. Covers arrangement of mechanism in master clock.



1,092,708.—Lamp Guard.

1,092,754. Thermostatic Circuit-Closer. R. L. Shannon, Ripley, Miss. Includes means for making temperature adjustments.

1,092,764. Electric Furnace for Metallurgical Purposes. H. H. Buckman, Jr., Indianapolis, Ind. Has a number of electrodes on horizontal rotatable support.

1,092,790. Electric Heat Unit. P. C. Garrison and R. Boomer, Detroit, Mich. Heating coil imbedded in cement.

1,092,795. Shade-Holder Coupling. J. Jeczalik, assignor to W. Hegenscheidt, Worth, Ill. Has a circular collar.

1,092,797. Electric Speed-Controlling Means. H. A. Mayor, Glasgow, Scotland. A combination of induction motors.

1,092,803. Trolley-Wheel Mount. R. C. Showalter, Altoona, Pa., assignor of one-half to F. K. Thieme and one-fourth to J. P. Reilly. Permits of axial movement of wheel.

1,092,805. Electric Safety-Fuse. E. Weissberg, Cassel, Germany. Contains an insulating liquid filling.

1,092,810. Lamp Socket and Shade Holder. G. M. Dewar, Indianapolis, Ind., assignor of one-half to A. Thompson. A combined lamp socket and shade holder.

Patents Expired.

The following United States electrical patents expired April 13, 1914.

580,380 and 580,381. Supporting Means for Electric-Railway Supply-Conductors. H. P. Davis, Pittsburgh, Pa.

580,384. Electrical Indicating Wattmeter. T. Duncan, Fort Wayne, Ind.

580,428. Electrode for Secondary Batteries. F. W. Schneider, Triberg, Germany.

580,434. Telephone Transmitter. A. Stromberg and A. Carlson, Chicago, Ill.

580,457. Electric Hoist. J. A. Lounsbury, Chicago, Ill.

580,475. Electric Riveting Apparatus. E. Thomson, Lynn, Mass.

580,490. System of Constant-Current Generation and Regulation. T. H. Hicks, Detroit, Mich.

580,497. Galvanic-Battery Element. G. Laura, Turin, Italy.

580,519. Circuit-Controlling Apparatus. F. M. Brinckerhoff, Matteawan, N. Y.

580,523. Galvanic Battery. R. W. Gordon, Boston, Mass.

580,552. Burglar-Alarm System. D. M. Munro, Gaithersburg, Md.

580,557. Electric Headlight. R. P. Schwerin, San Francisco, Cal.

580,584. Art of Insulating Electric Conductors. A. J. Robertson, Chicago, Ill.

580,598. Electric Locomotive. W. S. Elliott, Pittsburgh, Pa.

580,617. Printing Telegraph. H. Kreusler, Kreischerville, N. Y.

580,628. Insulator and Insulating Conduit or Tubing for Electrical Purposes. F. G. Treharne, Llanishen, England.

580,657. Non-Inductive Adjustable Carbon Resistance. S. P. Blackmore, Johannesburg, South African Republic.

580,663. Means for Controlling Electric Currents. E. Ellicott, Chicago, Ill.

580,678. Electric Switch. T. H. Brady, New Britain, Conn.

580,680. Alarm Lock. J. H. Doscher, Brooklyn, N. Y.

580,734. Electric Arc Lamp. A. C. Seibold, Mount Vernon, N. Y.

580,820. Electromagnetic Locking Device. E. J. M. Scheren, Denver, Colo.

580,836. Electric Searchlight. R. M. Hunter, Philadelphia, Pa.